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Egypt beyond the Crisis

Medium-Term Challenges for Sustained Growth

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Abstract

The paper analyzes the impact of the recent global crisis in the context of the previous two decades' growth and capital flows. Growth decomposition exercises show that Egyptian growth is driven mostly by capital accumulation. To estimate the share of labor in national income, the analysis adjusts the national accounts statistics to include the compensation of self-employed and non-paid family workers. Still, the share of labor, about 30 percent, is significantly lower than previously estimated. The authors estimate the output costs of the current crisis by comparing the output trajectory that would have prevailed without the crisis with the observed and revised gross domestic product projections for the medium term. The fall in private investment was the main driver of the output cost. Even if private investment recovers its pre-crisis levels, there is a permanent loss in gross domestic product per capita of about 2 percent with respect to the scenario without the crisis. The paper shows how the shock to investment is magnified due to the capital-intensive nature of the Egyptian economy: if the economy had the traditionally-used share of labor in income (40 percent), the output loss would have been reduced by half.

This paper—a product of the Poverty Reduction and Economic Management, Middle East and North Africa Region —is part of a larger effort in the department to analyze the drivers of growth and examine the growth prospects of the region's countries in the medium term. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org.
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EGYPT BEYOND THE CRISIS: MEDIUM-TERM CHALLENGES FOR SUSTAINED GROWTH

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INTRODUCTION AND SUMMARY

In the three years preceding the recent crisis, Egyptian GDP growth averaged over 7 percent per year. The adoption of market-oriented policies, together with a boom in commodity prices and in capital inflows lifted growth to unprecedented levels during three consecutive years. Foreign direct investment flowed into the country and capital formation turned into the driver of growth. The virtuous circle of capital flows, investment, and growth, seemed to have no end. There were some signs of trouble, however: rising inflation, an appreciating currency, and high unemployment rates, especially among women. These challenges seemed manageable, and the diagnosis was that the trickle-down effect from growth would allow polishing off these rough edges. The future seemed to have finally arrived in Egypt.

The global shock that hit Egypt in mid 2008 was mostly an aggregate demand shock that reduced demand for Egyptian exports and lowered private investment due to increased uncertainty and weakened foreign direct investment. The shock led to a revision of expectations and questioning on the growth strategy, on the extent to which the adverse global economic surrounding would affect Egypt, on the country's growth prospects and on the policy options ahead.

This boom-bust cycle is not the first one in Egypt, and it is certainly nothing new to emerging economies. The objective of this report is to analyze the current slowdown within a historical perspective, and to frame it within the country's long-term growth challenges. Our analysis of Egyptian growth since the 1990s shows that there are clearly differentiable boom- busts periods tracking international capital flows cycles. The boom periods are associated with rising total factor productivity (TFP), market-oriented reforms and fiscal contraction, while the bust periods are associated with falling productivity, higher public spending and sluggish economic reform. In spite of the procyclical productivity behavior, the growth decomposition exercise shows that capital accumulation is the main driver of growth in Egypt.

The shock led to slower output growth without a corresponding fall in factor utilization. Hence, real production costs increased per unit of output. This brings into consideration the determinants of productivity growth in Egypt in the medium term, and highlights that policy responses to the crises need to support long-term productivity growth. The shock was confronted mostly by a fiscal stimulus package, which was prudent (equivalent to 1.5 percent of GDP). However, some elements of the stabilization package, which were adequate as temporary measures to help firms cope with the fall in productivity or the rise in real cost of production, such as freezing the energy price adjustment program and lowering interest rates, artificially lower the user cost of capital and induce a higher capital intensity than would prevail absent such policy interventions.

In spite of the transitory impact on the growth rate, the crisis will have a permanent effect on the GDP due mainly to the lower capital accumulation during the 2009-2011 period. To regain the

output losses, investment has to be higher or productivity has to increase at a faster pace so that potential GDP growth exceeds the 6% prevailing before the crisis. Historical evidence shows that increased public sector spending is associated with lower TFP growth. Hence, given that the blunt of the crisis is over, it would be essential to gradually unwind fiscal stimulus spending and adopt a medium-term fiscal plan that prioritizes spending and supports allocation of resources to their most efficient use. Spending that enhances labor productivity and facilitates job creation, such as transport investment and enhancing the quality of education, should displace other spending items such as the energy subsidy. Such a plan would require targeted social safety nets, and coordination with the central bank to ensure that inflation does not erode the social welfare benefits during the transition period.

The paper is divided into three sections following this introduction. The first one describes the Egyptian boom-bust cycles since the nineties, and subdivides the period into three stages demarcated by the capital flows. The key drivers of growth in each stage are identified by a growth decomposition exercise. The second section quantifies the short-run impact of the crisis and analyzes the policy responses to it. The third section examines the long-run growth prospects and examines the policy implications.

I. GROWTH IN EGYPT: STYLIZED FACTS

This section analyzes the current bust period within Egypt's growth experience since the early nineties, identifying common elements and differences across different stages. We divide the two decades (1990-2009) into three sub-periods, based on the capital flows: a capital inflow period beginning in the early nineties (1991-1998), a stop in capital flows period (1999-2004) and a capital boom period between 2005 and 2008.[1] This section is divided into three parts. The first one presents some stylized facts of growth over the whole period, the second describes the sub periods, and the third one reports the growth decomposition exercises for each sub-period.

A. LONG-TERM GROWTH IN EGYPT: STYLIZED FACTS

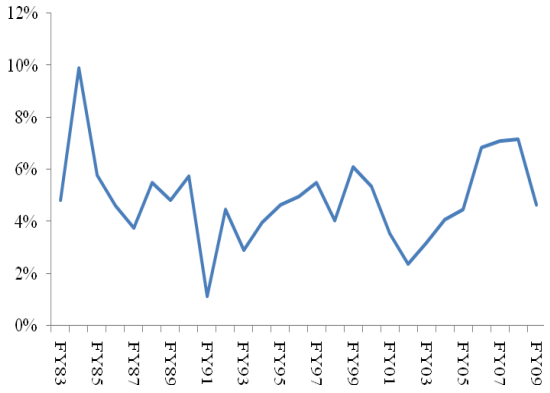
Growth in Egypt has been low and fairly stable. Between the early eighties until 2009, average growth was around 4.9 percent p.a. (Figure 1). This was below the growth in Asian emerging economies. GDP per capita growth was also below that of other non-oil producing MENA countries, though the differences have narrowed considerably in recent years. According to Enders (2007), Egypt experienced only three "growth spurts" (period longer than 2 years during which per capita

[1] There is no consistent official balance of payments information for the 70's or 80's, so we follow the capital flows series constructed by Ikram (2006), particularly useful to compare the late eighties with the early nineties.

growth exceeded 2 percent in each year) since the early eighties, the last one in 2004-08. These spurts followed trade liberalization, financial reforms and fiscal discipline. Growth volatility has also been fairly low (around 1.7 percent). On the other hand, periods of low growth (1986-1991 and 1999-2003) were typically longer and were associated with sluggish economic reforms and weak public finances.

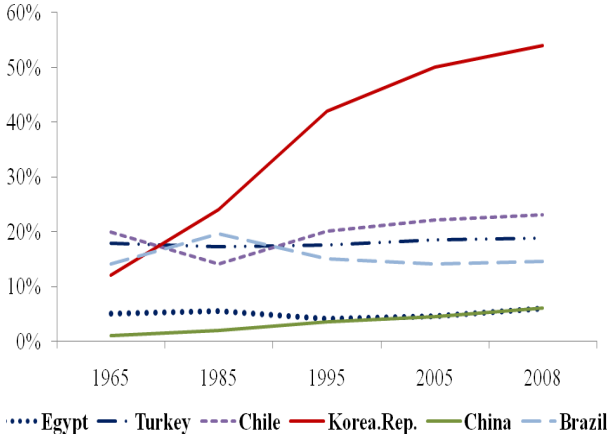
GDP per capita has been slow to converge to high income country's level. Comparing long-run GDP performance in Egypt with other countries that had similar income levels in 1965, we find that Egypt did not catch-up (figure 2). In fact, Egypt GDP per capita relative to that of OECD remained almost the same, between 5 and 6 percent over time. This contrasts markedly with the performance of a countries like Korea or China which have made substantial progress in catching up to the OECD country average.

Figure 1 – GDP Growth Trends



Source: Ministry of Economic Development

Figure 2 – GDP per capita
Constant US$2000 (percent of OECD GDP)



Source: World development Indicators WDI

There is a strong correlation between Egyptian GDP growth and OECD growth. A simple correlation between GDP growth in Egypt and the OECD illustrates the close linkage (Figure 3), first highlighted by Dobronogov and Iqbal (2005). This simple correlation might underestimate the real risk in the Egyptian economy, as the big output growth drops in Egypt tend to happen during recessions in the developed economies, or immediately following them. Figure 4 shows how the most significant drops in Egypt's output growth occur during US recession years (shaded in gray), with the exception of 1967 which was a year of war for Egypt[2].

[2] 1973 was also a year of war, but one concurrent with a recession in the US.

Figure 3 – Correlation between Egypt's and OECD's GDP growth rates

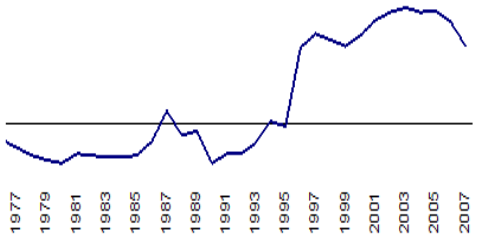
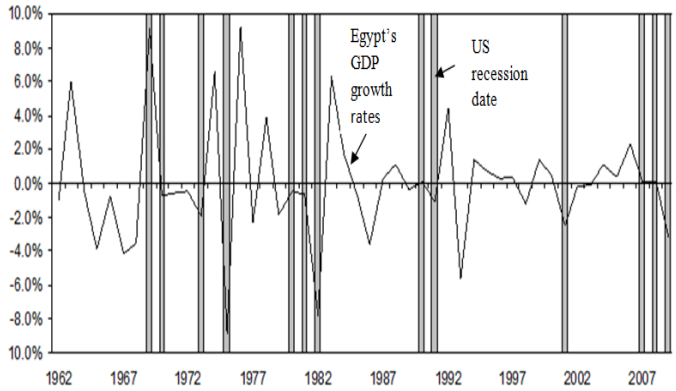


Figure 4 – Strong Correlation between drops in Egypt's growth and US recession years



Recent empirical studies on growth in Egypt find that physical capital accumulation accounts for most of the changes in aggregate production, though its role has been declining since the early 1980s. Meanwhile, improvements in productivity since the second half of the 1990s partially compensated this decline. For instance, Kheir-El-Din and Moursi (2003) analyze sources of aggregate economic growth from 1960 until 1998 and find that capital accumulation was the main driving force behind economic growth during that period, mainly because of the substantial quantities of unqualified labor and the prevailing employment laws which fostered the adoption of capital-intensive production techniques. IMF country report (2005) extends the same analysis for a longer period (1960-2004) and finds that both physical capital accumulation and TFP growth were important determinants of growth in output per worker in Egypt from 1960 to 2004, but their relative importance changed over time. It also finds that the current slowdown in growth of output per worker is due to the confluence of a decline in trend growth of physical capital per worker, and a negative cyclical deviation in TFP growth.

Other studies undertook a diagnostic decision-tree approach to investigate constraints to growth in Egypt. Dobronogov and Iqbal (2005) examine three constraints between 1960 and 2003: low rates of return to capital (particularly private capital), low appropriability of returns (as a result of high tax rates, inefficient tax structure or high expected appropriation risk) and a high shadow price of finance (due to low domestic savings, poor financial intermediation or lack of access to finance). They report a high correlation between GDP per capita growth rate and the growth of domestic private sector credit, and conclude that inefficient financial intermediation constrains growth. Using the same methodology between 2000 and 2006, Enders (2007) explores other binding constraints to growth in Egypt: access to finance (low national savings, limited access to foreign savings or weak financial intermediation), appropriability of returns (formal taxation, fear of future taxation, cost of bureaucratic regulation, corruption and the cost of innovation and exploration) and availability of complementary factors of production. However, Enders concludes that inefficient financial

intermediation and the appropriability of returns are the most important constraints to growth. Private returns are reduced through the high cost of complex regulations and inefficient government services as well as the cost of innovation and exploration. He further suggests that the recent pick-up in growth was unrelated to efficiency improvements in the financial sector.

B. ANALYSIS OF SUB PERIODS

The two decades since the early 1990s can be roughly divided into three sub-periods, according to the international capital flows: a first period of capital inflow in the early 1990s following the adoption of economic reform (1991-1998); a second period of capital outflow (1999-2004); and a third period of capital inflow (2005-2008).[3] Tables 1.a to 1.d describe policies and outcomes during the three sub-periods. This section shows the commonalities and differences across the sub-periods.

GDP growth is procyclical with the external capital inflow/outflow, though domestic reform also follows a pattern of the external cycle. Following the adoption of the Economic Reform and Structural Adjustment Program (ERSAP) in 1991, GDP grew at an average rate of almost 4 percent in the first period, peaking at 5.5 percent in FY97. The ERSAP aimed at resolving the macro imbalances through market-oriented reforms, namely, increasing the private sector participation, boosting international trade and privatizing many state-owned companies. A large fiscal adjustment brought the fiscal deficit down from 15 percent to 1.2 percent of GDP between FY91 and FY95 (Ikram, 2006). Yet, as a result of reform fatigue, a lack of fiscal discipline, and a shock to external capital flows due to the Russian default and Long Term Capital Management Crisis in the United States in 1998, Egyptian growth reached a trough of 2.4 percent in FY02. Macroeconomic reforms resumed in FY05, the external environment improved and growth picked-up to 6.4 percent between FY05 and FY08 from an average of 4.1 percent in the previous period.

The increase in net foreign assets (NFA) of the central bank was significant in both capital inflow periods. In the first one, NFA increased by US$ 1.2 billion per year on average, while in the second they increased by US$7.5 billion. The difference between both was that the second period flows were mostly foreign direct investment (FDI) which increased from less than 1 percent of GDP in the early 2000s to 8.1 percent in 2008. A topic that deserves further exploration is the relationship between the increase in capital flows and the stagnation or fall in the savings rate in the early 1990s. While Enders (2007) shows a stagnation or slight decline in the savings rate since the mid 1990s, Favaro, Garrido and Stucka (2009) show a significant fall in the savings rate from the early 1990s to the late nineties. This would imply a negative association between capital flows and domestic savings. This fall could also be associated with prevailing negative real interest rates since 2005. The

[3] Ikram (2006) constructs a consistent BoP series for the period 1952-2000, that show capital flows rising sharply after the adoption of the ERSAP and the Parid Club Agreement in 1991.

fall in savings, associated with rising capital inflows, also took place in Latin American and East Asian countries during the 1990s (Reinhart and Talvi, 1998).

Table 1.a - Real Variables

Period average	**1987-90**	**1991-98**	**1999-04**	**2005-08**
		Percentage change		
GDP growth	**5.4**	**4**	**4.1**	**6.4**
Imports of goods and services	3.0	3.2	3.7	25.2
Gross Fixed Capital Formation	-3.0	4.9	0.4	16.6
Private consumption	4.6	3.5	3.4	6.0
Public consumption	5.5	5.0	2.9	2.1
Exports of goods & services	11.5	3.3	10.2	23.4
Shares		*Percent of GDP*		
Imports of goods & non-financial services	35.1	28.6	24.1	34.4
Gross fixed capital formation	27.4	19.8	18.1	19.9
Private consumption	72.2	75	74.2	71.7
Public consumption	9.7	10.8	12.1	11.8
Exports of goods & non-financial services	23.9	22.9	19.6	30.9
Gross domestic savings	**16.3**	**14.3**	**13.9**	**16.5**

Source: Authors' calculations based on the Ministery of Economic Development and Central Bank of Egypt data.

Table 1.b - Fiscal Variables

Period average	**1987-90**	**1991-98**	**99-2004**	**2005-08**
Budget Sector		*Percent of GDP (unless otherwise stated)*		
Primary Balance	-12.0	3.2	-1.4	-2.0
Change in primary deficit (percentage point)	-1.7	1.9	-1.2	0.5
Overall Balance	-15.8	-3.8	-7.3	-8.0
Change in overall deficit (percentage point)	-2.3	1.8	-1.4	0.7
Net Public Sector Debt	na	100.5	92.3	91.2

Source: Authors' calculations based on the Ministry of Finance data

Table 1.c - Nominal Variables

Period average	**1987-90**	**1991-98**	**99-2004**	**2005-08**
		Percent (unless otherwise stated)		
CPI inflation	18.8	11.5	4.2	9.6
Average exchange rate (LE/US$)	1.8	3.4	5.2	5.6
Average tariff rate	na	11.5	10.3	4.3
Maximum tariff rate	na	30	28.1	12.3

Source: Authors' calculations based on the Central Bank of Egypt data.

Table 1.d - External Position Variables

Period average	**1987-90**	**1991-98**	**99-2004**	**2005-08**
	Percent of GDP (unless otherwise stated)			
Trade Balance	-7.8	-14.8	-10.5	-12.4
Suez Canal dues	na	3.5	2.4	3.3
Tourism	na	4.4	4.7	6.7
Private remittances	5.0	5.1	3.4	4.9
Private remittances (Bn US$)	3.7	4.1	3.0	6. 1
Current Account Balance	-1.3	2.5	0.7	1.8
Foreign Direct Investment (Bn US$)	1.0	1.0	0.7	8.6
Foreign Direct Investment	1.3	1.9	0.8	6.7
Capital flows	*Billion US$ (unless otherwise stated)*			
Net International Reserves	1.7	14.1	13.6	25.2
Not Foreign Assets, annual inflows	1.1	1.2	-0.9	7.5
External Debt	42.2	31.8	29.5	31.1
External Debt to Exports (%)	583	215.5	156	78.3

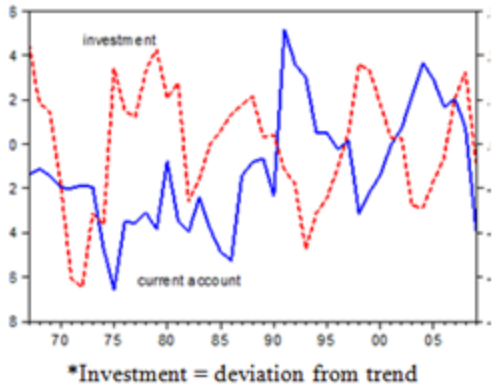
Source: Authors' calculations based on the Central Bank of Egypt and International Finance Statistics.

The current account, which represents the balance of saving of the economy with the rest of the world, shows a clear structural change in its level in the early 1990s. From being a capital importer from the rest of the world (negative current account), the country became a savings exporter in the early 1990s (positive current account). The structural shift coincides with the adoption of ERSAP. In 2009, the current account balance turned negative again, indicating a need for external savings in a period of crisis when the world financial system came to almost a complete halt.

The current account also shows an oscillating pattern around a given level. While that level was negative up to the late 1980s, it became positive since then. To examine the determinants of the current account behavior in Egypt we use a simple version of the Obstfeld and Rogoff (1996) intertemporal consumption smoothing model according to which the current account is determined by transitory deviations of income from its permanent level, by fluctuations of investment around their trend, and by transitory deviations of public spending. A simple regression shows that income and investment are statistically significant explanatory variables of the current account behavior in Egypt (see Annex 1). Figure 5 shows how investment is the main driver of the current account oscillation. In particular, the fall of investment up to the mid 1990s is associated with the change in the current account. The fall in public investment implicit in the economic reform program explains the fall in overall investment. The predicted values would be those that the consumption smoothing

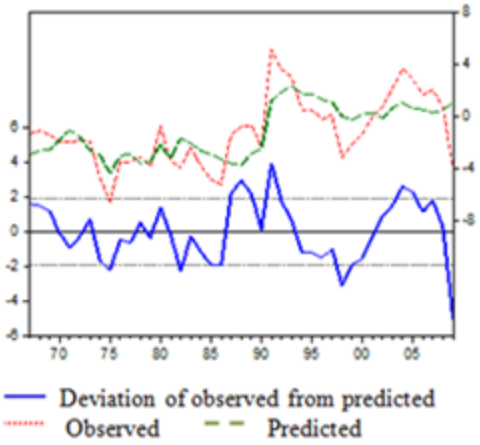
approach would imply, and it is clear that the observed levels are more volatile than the predicted values by the model. Still, there is a trend for the observed values to oscillate around the predicted levels, and deviations are transitory. This would indicate that deficits were excessive in 1998-2004, and that the observed 2008 deficit would revert to lower levels more consistent with those predicted by the consumption smoothing model of the current account (Figure 6).

Figure 5 - Current Account Balance and Investment 1967-2009



*Investment = deviation from trend

Figure 6 - Observed and Predicted Current Account Balances 1967-2009



Deviation of observed from predicted
Observed
Predicted

Another differentiating factor across the sub periods is the fiscal policy stance, with fiscal expansion taking place in the capital outflows period, and fiscal contraction taking place during the capital inflows periods. We examine the stance of fiscal policy based on two indicators: the change in the primary fiscal balance (or the overall balance, both as a share of GDP) and a quantitative measure of discretionary policy that controls for the potential reaction of fiscal policy to economic conditions proposed by Fatas and Mihov (2003). Fiscal impulse is traditionally measured as the change in the primary (or the overall balance), while the second indicator is defined as the residual of the following model:

$$\Delta G_{i,t} = \alpha_i + \beta_i \, \Delta Y_{i,t} + \gamma_i \Delta G_{i,t-1} + \ \delta_i \, \mathbf{W_{i,t}} + \epsilon_{i,t} \qquad (1)$$

where: - ΔG is the growth rate of government spending;

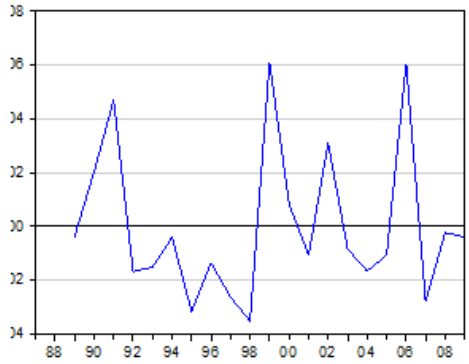
- ΔY is the output growth;

- W is a vector of control variables including a time trend

Both indicators of fiscal policy indicate that during the capital inflows periods, fiscal policy tends to be restrictive, while during the capital outflows fiscal policy has been expansionary. The first sub-period of capital inflows was one in which policy was contractive, while the capital outflows period, during 1999-2004, fiscal policy was, in general, expansionary. The last sub-period, 2005-2008, was

mostly contractionary with the exception of 2005 and 2008. Figure 7 shows the evolution of such index that control for the potential endogeneity of fiscal policy that can react to economic conditions.

Figure 7- Index of Discretionary Fiscal Policy Egypt, 1987-2009



Source: Authors' calculations based on Fatas-Mihov (2003)

Inflation has been persistent, but higher in both capital inflows period (close to 10 percent) than in the other period (close to 4 percent). Long-term inflation in Egypt has been moderate but has displayed important fluctuations since the beginning of this decade, with two big spikes in 2004 and 2008, and a smaller one in 2006. Inflation has remained in double-digit levels over the past few years. Kiguel and Okseniuk (2009) show that long-term inflation is explained by traditional factors, such as the fiscal deficit, seigniorage, the output gap, and the level of the real exchange rate. Yet, while supply shocks or demand pressures may account for rising inflation in the short-term, the misallocation of resources is responsible for inflation persistence. This is the result of factors such as weak market institutions, market concentration and lack of competition, ineffective consumer protection as well as misguided policies to maintain production costs or food prices lower than those which supply and demand conditions would determine. This set of factors also affects long-term growth.

C. GROWTH DECOMPOSITION EXERCISES

Analyzing the growth decomposition in the Egyptian economy allows identifying key drivers of growth. This section presents several growth decomposition exercises: by components of aggregate demand, by sector of economic activity, and finally, by factors of production.

1) Growth decomposition by demand components

While growth in the first boom period (91-98) was driven by consumption, the second one was driven mostly by exports and investment. As to the recent boom prior to the crisis, it was mostly driven by exports and investment (Table 2). Between 2005 and 2009, the boom in investment is

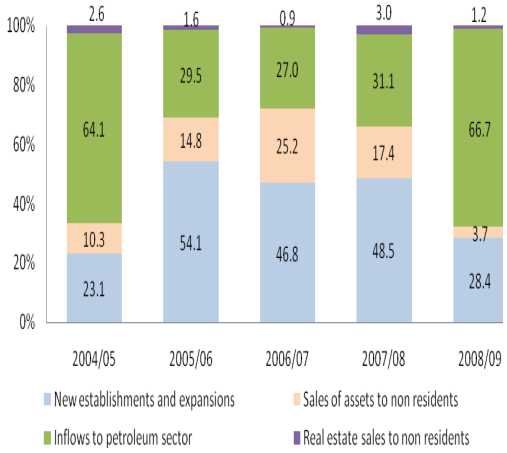
associated with a surge in FDI (see statistical appendix in annex 5). As a result of the crisis, not only did foreign direct investment decrease, but investments composition changed in favor of oil-related flows. This is expected to have a more limited favorable impact on growth due to restricted linkages to the rest of the economy and lower technology transfer. In fact, the share of FDI inflows to petroleum sector doubled (Figure 8).

Table 2 – Contribution to Growth by Demand Components

Period average	**1991-1998**	**99-2004**	**2005-08**
		percent	
Consumption	144.7	63.3	44.5
Private Consumption	127.4	54.7	40.5
Public Consumption	17.3	8.6	3.9
Investment	-52.8	20.2	49.7
Private Investment	50.6	-13.6	11.4
Public Investment	-67.8	29.9	40.9
Exports	33.8	36.8	147.1
Imports	25.8	20.3	141.3
GDP	100	100	100

Source: Authors' calculations from the Ministry of Economic Development data

Figure 8- Uses of FDI between 2004 and 2009



Source: Ministry of Investment

2) Growth decomposition by economic sector

Glancing at the contribution to growth of each sector, it is worth highlighting the stability of the contribution of services throughout the entire period, remaining above 50 percent. The Suez Canal and tourism (hotels and restaurants) are important contributors in this respect. The growing importance of the contribution of industry has taken place to the detriment of agriculture, and this trend is expected to continue in the near term, as the global crisis will limit both the volume of trade transiting through the canal and the number of tourists travelling to Egypt.

Table 3 - Contribution to Growth by Economic Sectors

Period average	**1991-98**	**99-2004**	**2005-08**
Agriculture	13.9	14.1	8.4
Industry	33.9	28.9	38.3
Services	52.2	57.1	53.3
of which			
▪ Suez Canal	-2.1	5.4	7.4
▪ Restaurants & Hotels	0.0	6.5	8.8
GDP	100	100	100

Source: Authors' calculations from the Ministry of Economic Development data

3) Growth decomposition by factors of production

This section decomposes growth into factor accumulation and productivity change, based on similar exercises done previously for Egypt by Loayza and Honorati (2007) and Favaro, Garrido and Stucka (2009). The rate of change of physical capital is estimated based on historical investment figures with a constant depreciation rate. The rate of change in human capital is estimated as in Ghosh and Kray (2000) and applied to Egypt by Favaro et al. (2009), but we modify it along three lines: first, we consider the share of labor income to be 40 percent, rather than the 60 percent used in the previous application to Egypt. [4] Previous growth decompositions exercises for Egypt considered a higher share of labor, believing that the share of labor income could be underestimated because the income of self-employed is imputed as capital income (Gollin, 2002 and Bernanke and Gurkaynak 2001).

While such an adjustment could have produced significant changes in estimating the labor share in national income in the past, presently its effect might not be as large given the decline in self-employment in Egypt, from 25 percent in 1986 (El Ehwany and El Laithy, 2001) to about 11 percent at present (Assaad, 2009).[5] Annex 2 describes our calculation of the share of labor in national income, which oscillates between 32 and 36 percent. In order to avoid overstating this point, we arbitrarily raise the share to 40 percent, still significantly lower than the 60 percent used in traditional growth decomposition exercises. The capital intensive nature of the Egyptian economy is an important feature for at least two reasons: first, there will be low elasticity of employment with respect to output; and second, the higher the share of capital the larger will be the impact on GDP of any shock to investment. Both implications of the capital-intensive feature of the Egyptian economy have important consequences for the analysis of the impact of the crisis on Egypt as will be seen in the next two sections.

Two other differences with previous growth decomposition studies are the use of a variable rate of return to education through time, as well as a changing participation rate in the last years (Said, 2009). The rising rate of return to education in the decade between 1998 and 2006, as well as the increasing rate of labor participation imply higher rates of human capital accumulation.

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[4] Using social accounting matrices, several studies found that the share of capital in output increased from 68 percent in 1988, to 69 percent in 2001, and to 73 percent in 2007 (Eckaus et al., 1981; Akhter et al, 2001; and Kantor Management, 2009). Yet, the share of labor income might be underestimated because the income of self-employed is imputed as capital income (Gollin, 2002 and Bernanke and Gurkaymak 2001).

[5] Note that the first study is based on Household Income and Expenditure Surveys (HIES) while the second one is based on Labor Market Surveys.

Total factor productivity (TFP) growth is the residual of the actual GDP growth rates and the growth rates in physical and human capital, multiplied by their shares in national income. Results in Table 4 show that: 1) factor accumulation is the driver of growth in Egypt, similar to results of Kheir el Din and Moursi (2007) and Favaro et al. (2009); 2) physical capital accumulation is the main driving force in periods in which FDI is booming (early 1990s and late 2000s); and 3) TFP growth is positive during the reform periods, and negative in the policy reversal sub period. The results are worrying in terms of the prospects for growth, to the extent that capital accumulation is subject to decreasing marginal returns. This was the base of Krugman's (1994) pessimism on the growth prospects of East Asian countries whose growth was also driven by capital accumulation.

International experience shows that productivity growth accounts for most of the difference between successful growth experiences and unsuccessful ones (Easterly and Levine, 2001). But it also shows that countries growth may be driven by factor accumulation initially, and then be driven by productivity growth such as in the US experience in the late 19th century and Japan during the early 20th century (Kim, 2001).

Table 4 - Contribution to Growth by Factor Accumulation and TFP Growth

Period average	**1991-1998**	**1999-2004**	**2005-08**
		percent	
Human Capital	0.22	3.18	2.32
Physical Capital	1.94	2.42	3.36
TFP	1.79	-1.49	0.7
GDP growth rate	**3.9**	**4.1**	**6.4**

Source: Authors' calculations

The rise in capital intensity, especially since 2001, is partly explained by the energy subsidies and the negative real interest rates. With the increase in energy prices worldwide, the economic value of the subsidy in Egypt tends to increase, giving domestic producers an unsustainable competitive edge. On the other hand, negative interest rates experienced in Egypt induce a low cost of capital, which explains the acceleration of investment described in the above section.

Evidence for Egypt shows that TFP falls when unsustainable policies are adopted and rises during periods of market-oriented reform. From Figure 9, it can be seen that TFP growth was negative until the 1990s, when it turned positive. After a brief reversal during the late 1990s and early 2000s, TFP growth turned positive again. This evolution matches closely the three sub periods in which we subdivided the analysis in the present paper. The positive productivity growth sub periods match those of market-oriented reforms. The recovery of TFP growth in the 1990s is particularly related to two factors. First, the trade policy reform reduced the simple average tariff from 42 percent in 1991 to 26 percent in 1998. The reform process stalled in the early 2000s: during 2000-2004, the trade-

weighted tariff rose to 20 from 15.4 percent in the period 1995-1999. In 2005-2007, it was reduced to 13 percent. Macroeconomic aggregate data confirms trade's positive impact on growth (Loayza, 2009), and microeconomic evidence from firm-level data across countries shows that firms that engage in trade are more productive (Teal, 2007; Escribano, 2007). Evidence for Egypt supports this hypothesis by showing that exporting firms grow faster than non-exporting (Stone, 2009). Negative productivity periods such as in the 1980s, were characterized by rising public spending (the ratio of public investment to private investment doubled), fiscal deficits that relied on the inflation tax to be financed[6],and currency pegs leading to overvalued currencies that, jointly with the excessive spending, resulted in large current-accounts deficits. These results are verified econometrically by Kheir El Din and Moursi (2007) who find that productivity growth in Egypt is positively associated with export growth and negatively associated with public spending.

TFP growth (figure 9) is obtained from growth decomposition on a yearly basis starting 1960. TFP levels are then calculated based on the growth rates. Figure 10 shows that recovery of TFP growth since the early nineties still has ways to go to compensate the damage done during the seventies and eighties. The figure in levels is introduced for comparison with later estimates of capital productivity that show identical trends (figure 11)**.**[7]

Figure 9 - TFP Growth 1970-

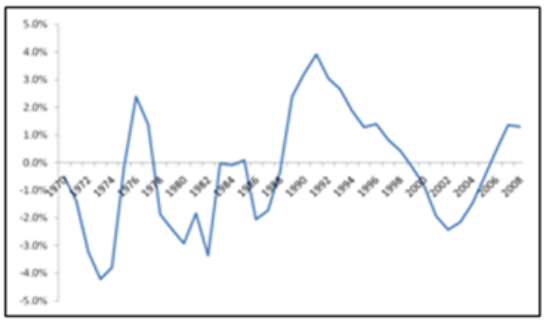
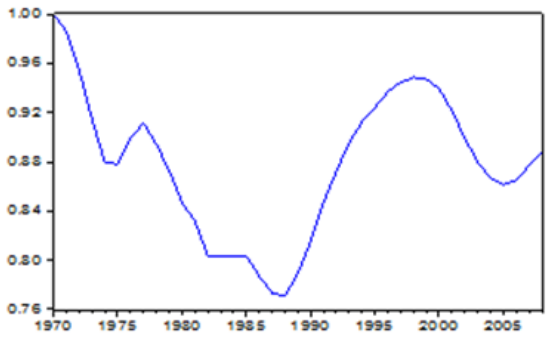


Figure 10 - TFP Levels 1970-2008

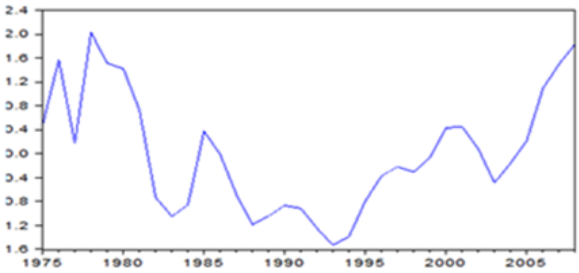


Source: Authors' calculations

[6] The inflation tax in the late 1980s in Egypt was estimated at almost 12 percent of GDP (Dinh and Giugale, 1991).

[7] The marginal productivity of capital can be approximated by the ratio of the rate of growth of GDP to the investment share in GDP as done in Favaro et al (2009) which assumes a specific form of the production function (AK type). Though it may seem an extremely restrictive assumption, the marginal productivity of capital trend is identical to the one of TFP estimated with the growth decomposition exercise.

Figure 11 - Trend of the Marginal Productivity of Capital* in Egypt (1975-2008)



Approximated as the ratio of growth to the investment output ratio. Source: Adapted from Favero *et al*, 2009. Normalized data to make the average of the entire period equal to zero

The second factor associated with rising productivity during the 1990s is the growing importance of private investment in overall capital formation (World Bank, 2008). The ratio of private investment to public reached a low of 0.34 in the early 1990s; this ratio rose to 1.0 by the end of the decade. Studies have estimated that aggregate productivity has been depressed by 30 percent due to the lower productivity of public production of goods and services and the widespread government participation in production; these facts also explain about 20 percent of Egypt's labor-productivity gap with the United States (Schmitz, 2001). Hence, the longer-term perspective of factor productivity indicates that trade facilitation and reduction of the size of public-sector activities relative to the private sector should be essential elements of any policy package to increase productivity. Also, Bernanke and Gurkaynak (2001) find a positive association between savings rates and TFP growth in a panel of countries that includes Egypt. Kose, Prasad and Terrones (2008) show that TFP growth is positively associated with FDI. Hence, productivity growth, which is essential for sustainable growth, requires increasing savings rates and attracting foreign direct investment.

To conclude, the various growth decomposition exercises show that boom periods have been driven by different sectors. The first boom was driven by domestic consumption and the second by external demand and investments. In general, the growth of the services sector account for most of GDP growth but during the second boom period, industry (particularly manufacturing) has been a large contributor to growth. Finally, empirical evidence shows that factor (capital) accumulation is the main driver of growth. This capital-intensive nature of the Egyptian economy is explained by the prevalence of energy subsidies and negative real interest rates which both artificially lower the cost of capital, which is the scarce resource. Also, the boom periods are associated with rising TFP, market-oriented reforms, trade liberalization and fiscal contraction. In addition to this, increasing the savings rate is essential for productivity growth.

II. EGYPT AND THE GLOBAL ECONOMIC CRISIS

The previous section showed that the recent boom period (2005-2008) was driven by external demand and investment. The increased export revenues, the surge in foreign direct investment and augmented remittances from abroad all led to the investment boom and high growth rates. Unfortunately, with the global financial crisis the main external sources of growth were expected to drop off sharply, leading to a considerable slowdown since the mid-2008. This section concentrates on the impact of the crisis on economic growth and analyzes the policy responses to it.

A. THE IMPACT OF THE CRISIS ON GDP AND EMPLOYMENT

1) The impact on economic growth

The impact of the global economic crisis on Egypt's growth was not as large as originally expected. The crisis reduced growth from 7 percent to 4.7 percent in FY09. All components of demand have been affected with lower net exports, consumption growth and investment. However, this is a better than expected outcome since early projections had forecasted FY09 economic growth between 2 and 4 percent.[8] This slowdown was also significantly less than in the developed economies or in most other emerging markets.

The better than expected performance can be explained by five factors. First, because of a lack of integration with the world financial system, Egypt's traditional banking sector had little direct exposure to the toxic assets in developed economies. Second, a positive – though declining – current account balance since 2005 (around 2 percent of GDP). Egypt's external needs were low in a context of global financial imbalances. Third, the fiscal stance and high nominal GDP growth led to significant declines in the public debt ratios in the years preceding the crisis. Hence there was room for policy maneuver, as Egypt had cushions that permitted assimilating the shock. Fourth, the limited role of private investment (around 15 percent of GDP in 2008) compared to the rest of the world, minimized the impact of the shock on overall investment, which suffered the bulk of the crisis impact. Also, the confidence crisis had a marginal impact on consumption growth which remained positive (around 5 percent). In the developed economies, for instance, business investment fell by 15 to 20 percent, while consumption only fell by 1 to 5 percent. Fifth, the response to the crisis was

[8] Other estimates include those of Abou-Aly, 2008 (4 percent in FY09), the IMF, 2009 (3.6 and 3 percent in FY09 and FY10 respectively), and the Ministry of Economic Development, 2009 (4.4 and 4.0 percent in FY09 and FY10 respectively).

prudent and adequate both in terms of the fiscal and monetary stimulus (see section on the assessment of the crisis). Yet, while these features have sheltered Egypt from the impact of the financial crisis, some of them, namely, limited financial development and low private investments have also been constraints to long-run growth.

The impact of the crisis fell squarely on the activities that experienced rapid growth in recent years. Only two sectors' output fell: oil refining (-4.2 percent) and Suez Canal services (-7.2 percent). Restaurants and hotels managed to maintain positive but very low growth at 1.3 percent. On the contrary, some sectors such as construction and building outpaced the previous year, up by 20.2 percent in FY09 compared to 15.7 in FY08. Other sectors kept growing at almost the same modest pace, such as wholesale and trade (at 5.8 percent), agriculture (3.2 percent) and real estate ownership (3.8 percent), while others like the financial services have seen their growth rate declining (4.6 percent compared to around 7.6 percent in FY08).

A World Bank private sector survey (World Bank 2009c) showed that small enterprises' sales (a proxy for output) fell by more than large enterprises' sales. Sales of small enterprises fell by 32 percent, while those of large firms dropped by 19 percent. Given that the shock was mostly to the tradable sectors, and large firms comprise the majority of exporting units, this was possibly due to the lower initial productivity level of smaller firms. In any event, if output contraction in small enterprises continues, the rise in unemployment will be larger than anticipated.[9] Any policy should, however, be directed towards increasing productivity in these units rather than artificially maintaining unproductive ones in operation.

Input utilization, especially of labor, has been slow to react; this implies lower factor productivity or, alternatively, higher real costs per unit of output.[10] The private sector survey showed that the median firm decreased its sales by 29 percent[11], while employment fell only by 5.6 percent. Hence, while output (measured by sales) fell quickly, employment has been slow to adjust, and the capital stock remains fixed, increasing the cost per unit of output. The fall in measured productivity resulting from external shocks has been documented before. For instance, Calvo et al. (2006) documented it in countries that suffered sudden stops in capital flows.[12]

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[9] El Mahdi and Rasheed estimate that 39 percent of total employment is in SMEs, or enterprises with fewer than 50 workers.

[10] Harberger (2005) uses interchangeably the terms "productivity growth" and "real cost reduction" (RCR), arguing that growth and production take place at the enterprise level and that the second term is better understood by entrepreneurs.

[11] This figure drops to 20 percent when sales-weighted results are considered. Inventories increased moderately by 4 percent, hence the drop in sales implies a fall in output.

[12] Other studies are: Conesa *et al.* (2007) studied the case of Finland after the collapses of its major trading partner, the Soviet Union. Also, Bergoeing *et al.* analyzed the case of Chile and Mexico after the interest-rate shock of the 1980s.

2) The impact on unemployment and poverty

Overall employment growth will likely decelerate over the next two years. Based on forecasted sector growth rates and each sector's elasticity of demand for labor, Favaro, Garrido and Stucka (2009) estimate that the employment growth rate would fall to around 2.3 percent, down from the 4.6 percent average registered between 1998 and 2006. This growth estimate is similar to that of El-Ehwany and El-Megharbel (2008).[13] However, the Favaro et.al. employment growth forecast was consistent with an overall GDP growth rate of 3.9 percent. But, since growth turned up to be higher than expected, we would need to adjust their forecasted figure. Using an elasticity of employment to output growth of 0.3, we adjust the Favaro, Garrido and Stucka employment growth forecast to about 2.8 percent (see Annex 3).[14]

The downward trend of unemployment observed since 2005 began to reverse, and the adjustment might be protracted. If employment growth falls to 2.8 percent as indicated above, and the labor force maintains the average growth rate of the past few years (an average of 4.3 percent from 2004 to 2008), the unemployment rate would rise to 9.6 percent by the end of 2009, up from 8.9 percent in FY08. This estimate coincides with econometric calculations based on the historical relation between economic growth and unemployment in Egypt for the period 1980-2007. An autoregressive distributed lag model (ARDL) yields a short-run coefficient of the changes in growth of close to 0.3, implying that a drop of 2.3 percentage points in growth (from 7 to 4.7 percent) would be associated with an increase in unemployment of about 0.7 percentage points (annex 4).[15] Given the relatively low value of the "Okun coefficient", as well as the low value of the elasticity of employment to output, we expect a jobless recovery.

The labor market is a cause of concern given the lower job creation rates, higher job destruction and increases in the size of the informal labor market. In addition to the effect of the sudden stop on job flows, the World Bank rapid survey (World Bank, 2009c) shows that large manufacturing firms are reducing employment more than small firms, making it likely that informal employment will increase. In emerging economies, the informal labor market expands as economic activity contracts, and hence it is countercyclical in nature (Perry et al. 2008). The expected increase in informality is

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[13] El-Ehwany and EL-Megharbel, 2008 found that a change of 1 percentage point in economic growth would lead to a change of 0.53 percentage points in employment in the same direction.

[14] The 0.3 elasticity of employment with respect to output is estimated by means of an Autoregressive Distributed Lag (ARDL) model. Using both yearly data for 1980-2009, or quarterly data for 2003-2009, the long run elasticity decreases in value and turns statistically insignificant when a deterministic trend is introduced, and the short run elasticity is 0.1. In the quarterly model, the long run elasticity is 0.3, with insignificant short run elasticity. This elasticity is lower than that reported in the previous footnote and generally used in studies of the labor market in Egypt.

[15] Annex 4 presents the estimation of Okun's Law, which captures an empirical relationship between changes in unemployment and changes in output growth. The estimated coefficient used in this paper is slightly lower than the .36 average reported by the IMF (2010) for a group of developed economies, and similar to the 0.3 originally estimated by Okun.

the result of two factors: a) wages are more flexible in the informal sector, and hence falling productivity results in a larger hiring drop in the formal sector; and b) the shock has been primarily to the tradable sector, composed mostly of formal-sector firms. The rise in informality is worrisome because the working conditions of the jobs are in general more precarious than in the formal sector. Herrera and Mohamed (2010) also find that wages in the informal sector are 13 to 14 percent lower than their equivalents in the formal sector.

The impact of the global crisis on poverty in Egypt is much less clear-cut than the impact of the crisis on employment and unemployment. Given the low elasticity of employment to output growth and the small size of the Okun coefficient described above, the only likely channel for the crisis to affect poverty is through the household income reduction originated by the fall in remittances from abroad. The balance of payments (BoP) shows that private remittances fell by 10 percent between FY08 and FY09, from US$8.6 billion to US$7.8 billion. Though the fall is moderate, it still leaves the level of post-crisis remittances above historical values. Using household income data for 2009, we found that only 7 percent of households that receive remittances from abroad are poor.[16]

How this reduction affects poverty is fuzzy for two reasons. First, because most households that have a migrant are non poor; Roushdy et al. (2008) report that 87 percent of the migrants belong to non-poor households. Our estimates based on household income and expenditure survey reported in the previous paragraph show that in 2009, only 6.6 percent of the households who received remittances were poor. We did a simple partial equilibrium exercise of reducing the value of remittances by 10 percent, and examining how this would change the number of poor households: it increased to 6.7 percent, which is a trivial change. This result confirms Roushdy et.al.'s finding that whether a household receives remittances is not a significant determinant of the poverty likelihood of households. The second reason that explains the difficulty in assessing the impact of remittances on poverty lies in their effect on labor supply decisions, which also affect poverty. Initially Roushdy et al (2008) reported that having a migrant in the household reduces the likelihood of being poor by 4 or 5 percentage points, though the same study reported that receiving remittances did not affect the likelihood of a household being poor. Subsequent work by Assaad and Binzel (2009b) showed that most recipients of remittances are females and that their labor participation rates increase with remittances. Hence, any analysis of the impact on poverty of remittances would have to control for the labor supply effect, which, to our knowledge, has not been done. All this evidence casts serious doubt of any significant poverty impact of reduced remittances from abroad in the case of Egypt.

3) The stabilization package

[16] Poor are defined as those having an income lower than 2,232 LE per person per year (World Bank, 2010). To determine whether the household is poor, we multiply the 2,232 LE by the number of persons in the household and compare it with its income.

The government adopted a series of measures to stabilize output growth at around 5.5 percent, which was the level consistent with a constant unemployment rate and close to our estimate of the potential growth rate of the Egyptian economy presented in the next section[17]. In FY09, the government increased its spending by LE 13 billion on infrastructure (mainly drinking water and sewerage) and supporting manufacturing. Moreover, additional spending was included in the FY10 budget, taking the projected budget deficit to 8.2 percent of GDP in 2010. In addition to the fiscal stimulus package, the CBE cut its lending interest rate by 375 basis points by November 2009, which was facilitated due to receding inflationary pressures.[18] Also, it eased reserves requirements by counting commercial banks' loans to small and medium-sized enterprises (SMEs) as reserve requirement holdings. Other measures include freezing the energy subsidy phase-out plan until July 2010, lowering tariffs on over 250 items of imported intermediate and capital goods, and offering sales-tax exemptions on capital goods. This section discusses the medium-term sustainability of the policy mix adopted to confront the crisis.

Regarding the fiscal stimulus package, there are two major issues to address: a) its impact on GDP, and b) its effect on fiscal sustainability given the country's relatively high debt.

a) The impact of the fiscal stimulus package on GDP

The stimulus implied in the government's spending package is lower than what would be needed to offset the full impact of the fall in external demand. Econometric analysis shows that the increase in public investment necessary to achieve a 1 percent growth in Egypt ranges between 2 and 4 percent of GDP (Favero, Giavazzi and Missale, 2009 and Annex 4). By this measure, the stimulus package of 1.5 percent of GDP (which includes public investment as well as other categories of public spending) would not be sufficient to restore growth to the 2008 level.

The low impact of public investment on GDP is explained by the leakage of resources between investment and capital, and the crowding-out effect of public capital in the short run. It is important to differentiate between investment and public capital, as not every dollar of investment effort is translated into a dollar of capital stock. There are leakages or "inefficacy" of investment, and given accounting practices, some current expenditures may be included as investment. Additionally, there is evidence of strong substitutability between public and private capital in the short run in Egypt. In the long run, however, these two factors may be complements (Annex 4, Fawzy et al., 2006; World Bank, 2008). Both points imply the need for rigorous economic analysis of individual projects to

[17] A simple regression of the change in unemployment on (non-hydrocarbon) GDP growth during 1998- 2007 shows a constant unemployment rate attained when the growth rate is close to 5.5 percent (Favero,Giavazzi and Missale, 2009). Also, the last section of this paper has long term GDP forecasts showing potential GDP growth rates stabilizing at 6 percent per year.

[18] The CBE deposit rates were lowered by 325 basis points in the same period.

ensure the rationale of public sector intervention, and to minimize the leakage from public investment to public capital. Otherwise, the increase in public spending will not have the desired impact on growth and will leave the economy worse off due to the increased indebtedness or the higher taxation required paying for it.

b) The impact of fiscal stimulus on fiscal sustainability

The case for higher public spending must be balanced with a concern for sustainability, given that Egypt's public debt is already high. Egypt's net public debt is around 60 percent of GDP in 2009, down from about 83 percent in 2005. This fall was the result of the reduction in primary deficits, high nominal GDP growth, and the appreciation of the currency. Due to the crisis, these factors will not persist in the near future: primary deficits will remain high, inflation and real GDP growth will be lower, and the currency will not continue appreciating. Hence, the rapid fall in the debt-to-GDP ratio will stop, though this should not be a matter of concern in the medium term (Favero, Giavazzi, and Missale, 2009).

As long as the stimulus program is temporary, Egypt's fiscal situation will continue to be sustainable. The debt sustainability analysis under multiple scenarios of growth, inflation, and exchange-rate depreciation show that, as long as the primary deficit does not exceed the observed 2009 level by too much, and goes back to the planned reduction path, fiscal sustainability should not be a real concern. The most likely event will be a stabilization of the debt ratio in the medium term (until 2012), reverting to a downward trend. The key driver of debt dynamics in Egypt is the high potential growth rate of the economy combined with the relatively low cost of debt. In light of the sustainability concern, the priority should be to implement the already announced stimulus measures and allow the fiscal stimulus to unwind.

The increased flexibility of fiscal policy during the crisis may come at a cost of a higher than expected public debt-to-GDP ratio. To keep the cost of debt servicing under control, which has been one of the key drivers of the past successful debt reduction episode, it is important to consider international evidence of the direct relationship between fiscal variables and the cost of debt service (Caselli, et al., 1998: Drudi and Pratti, 1999; Herrera and Salman, 2008). Based on this evidence, we estimate that an increase of the debt ratio by one percentage point of GDP would raise the cost of funding by up to 40 basis points.[19] To mitigate the immediate impact on the cost, it is essential to

[19] A panel of developing countries shows that sovereign spreads are a function of the debt ratio (Herrera and Salman, 2008). The coefficient of the lagged debt ratio in the homogenous panel estimation is around 0.4, or 40 basis points. Allowing heterogeneity in the spread's response to debt, the range of estimates goes from 13 basis points to almost 60 basis points. The lowest estimate had an average primary surplus of over 4 percent of GDP during the period, which is far from Egypt's situation. A different method, employed by Suescun (2007), calibrates a general equilibrium model for Latin American countries. Adopting his formulation for the cost of debt, but scaling the initial level of interest rates in Egypt by the ratio of the marginal productivity of capital in Egypt to the LAC countries estimated by Caselli and Freyer (2006),

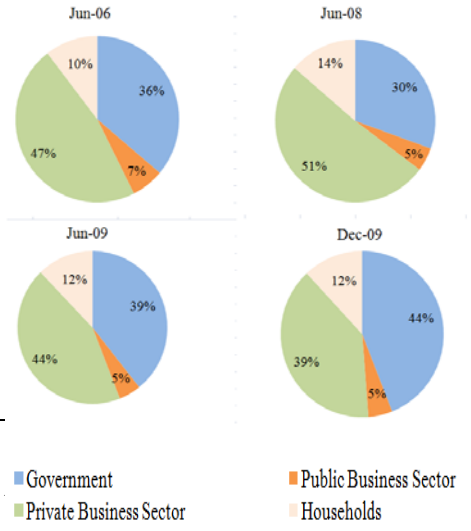
have a medium-term fiscal plan to reassure investors that the government will fulfill its debt-servicing commitments. A medium-term fiscal plan that is transparent and easily monitored would reassure investors of the government's sound fiscal fundamentals.

Public debt management has seen significant improvement, but more is still needed. More specifically, there is a need for continued effort in the development of capital markets in Egypt so that public-debt managers can extend maturities and diversify the base of debt holders. Of the total public debt, around 74 percent is domestic and 26 percent is external. Within the domestic debt, the marketable component (T-Bills and T-Bonds) has increased over time from 69 percent of gross consolidated government domestic debt in June 2008 to 76 percent in September 2009. This progress is welcomed and allows more market determination in prices. However, the marketable debt is relatively short term, and ownership is concentrated in banks. In terms of duration, T-bills' relative importance within the marketable portfolio is increasing, reaching 52 percent of the total marketable securities by September 2009, compared to 34 percent in June 2007. In terms of holders of public debt, in September 2009, public banks held 49 percent of outstanding T-Bills, up from 36 percent in 2007 (all banks –public and private- held 88 percent of outstanding T-Bills up from 63 percent in 2007). Diversification of the public-debt investor base is essential to reduce rollover and concentration risk. High levels of bank holdings of public debt are not uncommon in emerging markets. For instance, the IMF reports that about 40 percent of domestic public debt is held by banks (IMF, 2006). In Brazil, where banks are allowed to compute part of their debt holdings as reserve requirements, this proportion reaches about 50 percent of total T-bill holdings.

The crisis and the government's response changed the balance sheets of the banking sector, imperiling financing to the private sector if the fiscal plan and the public debt management strategy do not adjust accordingly with the global environment.

Figure 12 shows the composition of domestic credit of the banking sector from 2006 to 2009. Until 2008 the importance of the government as a user of funds had been gradually declining, but by December 2009 the government's share had increased to 44 percent of total domestic credit. This was the result of both a subdued demand for credit from the private sector, and increased demand for funding from the government. Though the current loans-to-deposit ratio indicates there is ample liquidity in the system, a broader perspective indicates

Figure 12 - Composition of Domestic Credit of the Banking Sector



Source: CBE, Monthly Bulletin (2010); World Bank staff calculations

yields a very similar estimate of close to 40 basis points. Our 10 basis points estimated by Casseli, Giovannini, and Lane for he

that the excess liquidity is being mopped up by the government as commercial banks increase their holdings of government securities. Further concentration of bank portfolios on government securities would be undesirable, as it would concentrate risk to all parties, and because it might imperil financing of the private sector as the economy recovers from the external shock. Though it is not uncommon in emerging markets for banks to hold relatively high portions of domestic public debt, international experience shows that the potential growth impact of fiscal policy diminishes as the share of public debt held by commercial banks increases (Abbas and Christensen, 2007).

c) Other stabilization policies

Despite the sudden stop in capital flows, the exchange rate remained largely stable. By the end of FY09, net international reserves were US$31.2 billion, down by US$3 billion from the December 2008 level. This fall understates the decrease in international liquidity because it does not include the CBE's other foreign currency assets, which fell significantly. At the end of July 2009, international liquidity fell to US$46 billion, a loss close to US$15 billion.[20] The fall in international reserves responds to a fall in demand for LE-denominated assets: M2 in local currency fell to 56 percent of GDP in the last quarter of 2008, and foreigner's holdings of T-Bills fell from LE 32 billion to LE 11 billion (approximately US$4 billion). In addition, foreigners' net sales in the stock market are estimated at about US$1 billion during the period August-March 2009. This indicates that the capital outflow has other sources besides foreigners leaving the market in times of crisis. However, the exchange rate only fell by 5 percent, suggesting that the depreciation of the currency has been mitigated by central bank intervention in the foreign exchange market.

Medium-term balance of payments projections indicate that the external sector may become a tighter constraint on growth than in the past. The IMF World Regional Outlook 2010 forecasts a current account deficit of about 2.6 percent of GDP in 2010, reducing to 2.1 percent in 2011. Hence, in the medium term policymakers should expect increased pressure on international reserves. Part of this pressure can be relieved by letting the currency float more freely and by modifying the public debt management strategy.

III. GROWTH PROSPECTS – EGYPT BEYOND THE CRISIS

In the analysis of Egypt's growth perspectives, it is important to look beyond the short-term effects of the crisis and examine Egypt's economy long-term transition after the crisis. This section provides an analysis of growth in Egypt in the next decade.

[20] The US$15 billion corresponds to the difference between the two stocks of international liquidity of the central bank (including international reserves and other assets in foreign currency) US$46 billion and US$31 billion.

The cyclical fall in productivity must be framed within a longer-term perspective. The procyclical behavior of productivity along the business cycle has been well documented and researched in developed economies (Bernanke, 2000). In these economies, productivity shows a stable long-run trend, and deviations from it are reversed through time. The shocks in these circumstances are transitory, and they explain most of the volatility of the series. Hence, a productivity rebound could take place after the global economy recovers. However, in emerging economies, the productivity trend is more volatile, and hence shocks tend to be more persistent. For instance, in Mexico, factor productivity recovered its pre-Tequila level only five to six years after the shock (Aguiar and Gopinath, 2007).

The crisis may have long-lasting impact on factor productivity for several reasons. First, subdued global demand for Egyptian goods and services is expected to continue for the few years to come. Second, as aggregate demand shifts from tradable producing sectors towards non-tradable sectors, such as construction and retail trade, resources will be reallocated to the latter, generating less value added per worker. Therefore, aggregate productivity will decrease. Moreover, due to costly labor mobility[21], resources will not be reallocated in tandem with the global recovery. Third, limited and more expensive access to finance for international corporations will slow down foreign direct investment, resulting in lower levels of capital formation. These expected outcomes imply slower technology transfer and lower capital/labor ratios, and hence, lower labor productivity. Fourth, the return of migrants from the GCC countries will imply less worker remittances, which are used productively by households (Assaad *et al.*, 2009a) and have a positive effect on schooling (Assaad, *et al.,* 2009b). Therefore, to mitigate these likely productivity-depressing long-lasting effects, the Government must resume structural reform policies that support real cost reduction.

A. PROSPECTS: IMPACT ON POTENTIAL GDP IN THE LONG RUN

To estimate potential GDP in the period 2010-2020, we adopt a production function approach. First we construct a potential GDP baseline based on assumed trajectories for human capital, physical capital, and productivity growth had there been no crisis. Second, we examine deviations of the medium-term (defined as ten years after the crisis) level of output from the baseline (or the level it would have reached without the crisis). We assume that the impact on potential GDP will be mostly through the effect of the crisis on capital accumulation, as has been the case in most OECD revisions of potential growth (OECD, 2009). We also assume lower TFP growth as a result of increased public spending (Kheir El-Din and Moursi, 2007) and reduced savings rates (Bernanke and Gurkaynak, 2000).

[21] The 2008 *Doing Business* indicators show that Egypt tops the list of countries on ending-employment costs: the cost of firing, in terms of weeks of salary, is 132 weeks, while in India it is 56, in Tunisia 17, in Morocco 85, and in Brazil 37 weeks.

1) The potential GDP baseline

The baseline scenario is the potential GDP that would have prevailed in the absence of the global crisis. The assumptions for physical capital accumulation, human capital accumulation and productivity growth are described in this section. First, the physical capital is projected by assuming as constant the ratio of investment to the GDP of the previous year (as in Favaro et al. 2009).[22] In 2008, the observed investment as a ratio to GDP of the previous year was 30 percent. Our baseline simulation holds this level constant throughout the forecasting scenario. This level is the highest of the decade, though not as high as the 40 percent registered during the nineties. The difference is in the composition of investment between public and private: in 2008 public investment was 32 percent of total gross fixed capital formation, while in the eighties it oscillated around 70 percent. In the baseline scenario the private-public composition is held fixed at the 2008 level. A constant depreciation rate of 3.7 percent is assumed.

The second element of our simulation, human capital, is constructed as in Favaro *et al.* (2009), but with modifications on the participation rate and the rate of return to education described in the first section.[23] The participation rate was forecasted assuming a slight increase from 53 percent to 54 percent in the 2010-2020, continuing the observed trend between 1998 and 2006. The rate of return to education was assumed constant at 8 percent, based on the observed behavior of the return to education between 1998 and 2006 (Said, 2009; Herrera and Mohamed, 2010).

Finally, the baseline scenario assumes TFP growth constant at 0.7 percent per year, the average level registered in 2005-2008. Though this is a high-growth period, TFP growth was not particularly high, compared to previous episodes, or by international standards. For instance, in high GDP growth episodes, countries typically have higher TFP growth (Harberger, 2005): in OECD advanced economies', TFP grew at a median rate of 3.1 percent per year; the Asian Tigers' TFP grew at a median yearly rate of 4.4 percent; and Latin American countries' TFP increased at a 3.4 percent median growth rate. With these assumptions, we estimate the potential GDP level, and its growth rate oscillates around 6 percent.

2) The long-run impact of the crisis on potential GDP

[22] This assumption is needed to avoid the circularity that would occur by assuming a constant ratio of investment to the GDP of the same year.

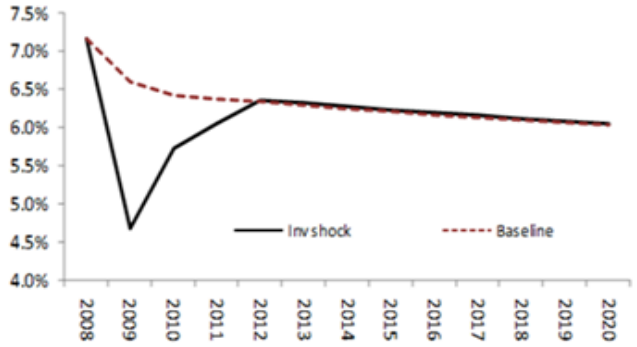
[23] Favaro *et. al.* construct human capital stocks (H) based on Ghosh and Kraay (2000) specification: $H_t = POP_t \times WAPR_t \times LFR_t \times e^{ROExSCHt}$, where POP_t is total population in year "t", $WAPR_t$ is the ratio of working age population (15-64 years) to total population in "t", LFR_t is the participation rate, ROE is a measure of Returns to Education and SCH_t is years of schooling.

The critical aspects to consider are the duration and magnitude of the shock that will affect capital accumulation and TFP growth. If we consider that the shock to investment arises due to increased risk aversion, it is important to examine how this variable has historically behaved after the shock.[24] Based on this past behavior of the risk aversion parameter, we initially assume that the pre-crisis levels of private investment will be recovered in 2012. We also do sensitivity analysis to examine full recovery in 2011 and 2010.

The shock to GDP took place through a drop in private investment. To determine the magnitude of the shock, we examine the behavior of private investment in the previous episode of a similar drop in growth, which occurred in 1991. During that episode, private investment to GDP fell to half its pre-crisis levels, from 10 to 5 percent of GDP. In this simulation, we assume a 30 percent fall in private investment, from 18 to 13 percent of GDP, which is close to the prevailing level prior to the FDI boom experienced since 2005. The simulation assumes a slight increase in public investment in 2009 and 2010 to 10.2 percent of GDP from 9.8 percent in 2008. With the new capital stock series, we estimate potential GDP and compare it with the baseline case.

Medium-term growth rates return to their pre-crisis levels. Figure 13 summarizes the deviation of the GDP growth rates, and shows the transitory nature of the shock. In the short term, the reduction in the growth rate is accounted for by the decrease in investment. The growth rate recovers from 4.7 percent to its pre-crisis trend – around 6 percent over the medium term by 2012.

Figure 13- Simulation 1: GDP Growth Rates under the Baseline an Crisis Scenarios

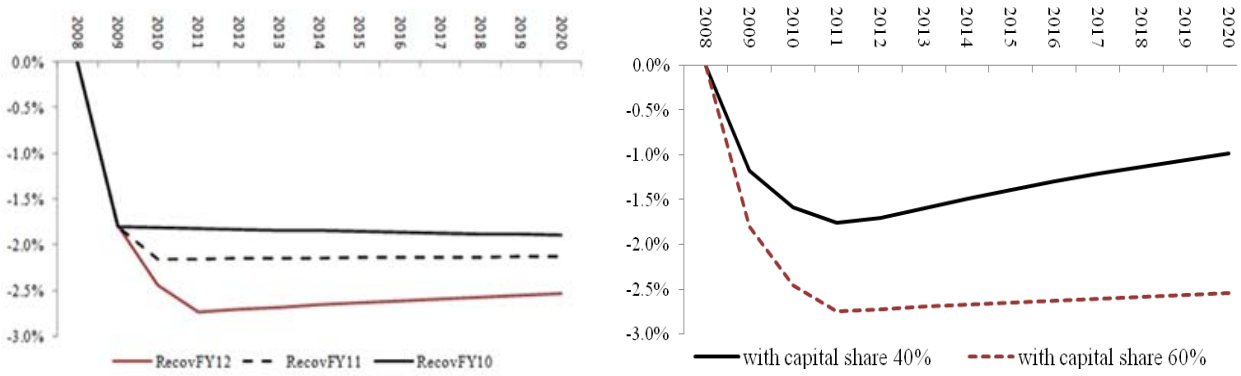


[24] Hakkio and Ketton (2009) suggest as indicator of risk aversion the Moodys spread between AAA and Baaa bonds. With data since 1919 we estimate the half-life of the shock following Mc Dermott's method, and we infer that the risk aversion indicator returns to its pre-shock level after 4 years. This is the adjustment that we take for the investment to GDP ratio, as well as the TFP growth.

We examined the sensitivity of these results to the assumption of recovery of investment levels by 2012. Figure 14.a shows the deviations of GDP growth from the baseline with full recovery in 2010, 2011 and 2012. The quicker is the recovery of private investment, the lower the long-term cost of the crisis. Even if full recovery of private investment takes place in 2010, by 2020 there will still be an effect of the financial crisis on Egypt's GDP. Figure 14.b shows that the output loss is larger when capital share in output is higher.

Figure 14 – Simulation 1-GDP In levels, deviation from baseline growth

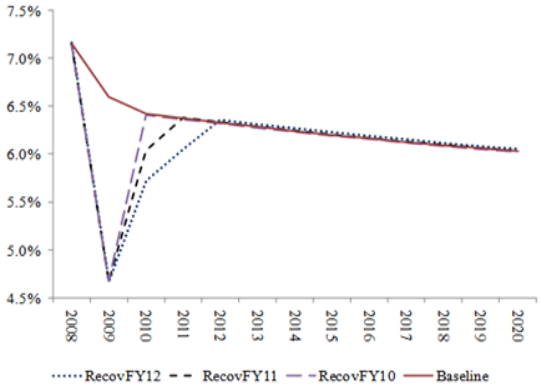
a) Different recovery dates **b) Different Capital Shares**



Source: Authors calculations.

In all cases, however, the output level does not recover to its pre-crisis trend. In spite of the transitory impact on the growth rate, there will be a permanent effect on the GDP levels, as shown in Figure 15. This loss in GDP level results from the lower private capital accumulation and productivity. This exercise suggests that output does not return to pre-crisis level within ten years after the crisis even after investment is brought back to its pre-crisis level. Thus, unless investment overshoots its pre-crisis level, the output will always be smaller than the benchmark case (no crisis scenario).

Figure 15- Simulation 2: GDP Deviations from Baseline Level, different recovery dates



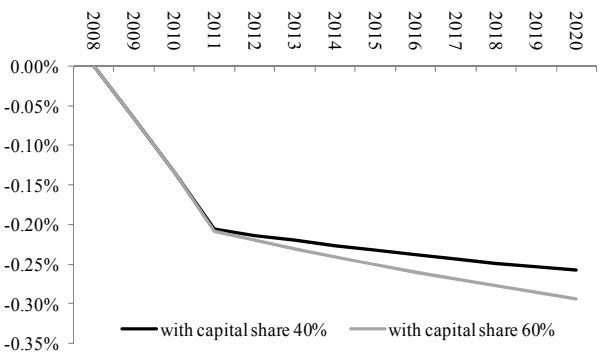
Source: Authors calculations. Figures shown are in percentage change with respect to the baseline scenario.

These results are similar to those of the World Economic Outlook (WEO, 2009). Considering 88 economies that experienced significant crisis over the last four decades, output was about 8 to 9 percent lower than it would have been without the crisis. Here the impact is much lower, but so was the impact of the crisis on GDP.

The previous exercise has two important limitations: a) it assumes a constant TFP growth in spite of decreased private investment; and b) it assumes that the public capital stock remains constant, and that the productivity of both private and public capital is the same. For the moment we wish to point out that in 1991, the fall in private investment coincided with a rise in public investment of an almost equivalent amount. Given the differences in the productivity of public and private capital estimated by Favero Giavazzi and Missale (2009) and Annex 4, the output drop would occur more from the change in composition than in the levels of capital stock.

TFP growth decreased as a result of the crisis. Empirical studies for Egypt show a negative association between increased public spending and productivity growth (Kheir El DinMoursi, 2007). International evidence (Bernanke-Gurkaynak, 2001) shows that there is a positive association between savings and growth. As a result of the crisis, both public spending increased and national savings rates decreased, and these existing empirical results provide us the only basis to quantify the impact on productivity in Egypt. Kheir El Din and Moursi show that increased public spending of 1 percent of GDP is associated with a fall in TFP growth of about 10 percent, and Bernanke and Gurkaynak estimate that a fall in savings of 1 percent of GDP leads to a similar fall in TFP. Figure 16 shows the deviation of GDP from the baseline given a 10 percent fall in productivity growth in 2010 and 2011, recovering the baseline growth of .7 percent in 2012. By 2020, potential GDP is around 0.25 percent lower than the baseline. The Figure also shows that decline in GDP resulting from a decrease in TFP growth seems to be long-lasting. And again, the higher the capitals share in output, the larger the resulting output loss.

Figure 16 - Simulation 3: GDP Deviation from the Baseline Level arising from a decrease in TFP growth



Source: Authors calculations. Figures shown are in percentage change with respect to the baseline scenario.

B. IMPLICATIONS FOR POLICY

The only way to recover the long-run GDP losses estimated in the previous section is by adopting policies that lift the potential GDP growth rate above the 6 percent prevailing before the crisis. This can be achieved through higher productivity growth rates or by increasing permanently the rate of capital accumulation, either physical or human. Higher permanent rates of capital accumulation require stable funding sources, such as domestic savings. Given the trend and level of domestic savings in Egypt, this does not seem a viable option in the short term. The rate of human capital accumulation can be changed through increasing the labor force participation and through increases on the return to education. All these are elements of a medium-term agenda. The most viable alternative in the short to medium-term is through higher growth rates of productivity.

We identify two factors that are critical to productivity growth in Egypt. The first one is the public spending channel, particularly in infrastructure and transportation sector. Recent international evidence shows that reducing commuting costs by 10 percent can increase labor productivity by 1 or 2 percent (Rice and Venables, 2004). The critical question is how much public spending can actually reduce commuting costs. Winston and Langer (2006) estimate that for each dollar spent in highway construction, commuter costs decrease by 11 cents. Extrapolating these precise figures to the Egyptian setting to estimate the impact of additional infrastructure spending on commuting costs to infer the resulting increase in productivity would be highly speculative.

Another study of the relationship between infrastructure spending and growth in Egypt (Loayza, et.al. 2009) finds that the country has a level of infrastructure similar to other countries of similar income per capita. The study showed that additional spending in infrastructure by 1 percentage point of GDP could increase growth by half a percentage point after one decade, and could reach 1 percentage point of additional growth after three decades. These results coincide with evidence presented in Annex 4 and in Fawzy (2006), of the complementary nature between public investment and private capital formation: a shock to public capital by 1 percent of GDP is associated with a rise in private capital of around 0.5 percent (equivalent to .6 percent of GDP) 5 to 6 years after the shock.

The more long term issue is how to shift from a factor-accumulation based growth strategy to a productivity growth based process. There are both microeconomic and macroeconomic studies of determinants of productivity in Egypt. On the micro side, studies of productivity of Egyptian firms (Escribano and Pena, 2010) show that the main factors affecting productivity are transportation and logistics costs, labor skills, and product quality and innovation. At the macro level, studies of the determinants of productivity growth in Egypt (Kheir El Din and Moursi, 2007; World Bank, 2008) point at the consolidation of fiscal adjustment, the advancement of trade integration, lowering inflation, improving infrastructure, and advancing institutional reform as necessary factors to support productivity growth. The bulk of the institutional reform, as described elsewhere (World Bank,

2009) is related to the creation of the conditions that enable a more dynamic private sector to emerge. These findings, together with the historical perspective of how countries change from a phase of capital accumulation to another of productivity growth, should serve as a roadmap for policymakers as to the strategies to adopt for sustained growth in Egypt.

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Annex 1 - Determinants of the Current Account, 1967-2009

Dependent Variable: CAUSB
Method: Least Squares
Sample: 1967 2009
Included observations: 43
White Heteroskedasticity-Consistent

	Coefficient	Std. Error	t-Statistic	Prob.
LINV_CYC	-5.71	2.03	-2.81	0.01
LGDP_CYC	8.35	4.77	1.75	0.09
LGOV_CYC	1.78	3.81	0.47	0.64
DERP	3.28	0.59	5.6	0
C	-2.62	0.3	-8.86	0

R-squared	0.54	Mean dependent var	-1.17
Adjusted R-squared	0.49	S.D. dependent var	2.67
S.E. of regression	1.9	Akaike info criterion	4.23
Sum squared resid	136.88	Schwarz criterion	4.43
Log likelihood	-85.91	Hannan-Quinn criter.	4.3
F-statistic	11.26	Durbin-Watson stat	0.88
Prob(F-statistic)	0		

CAUSB= Current Account in US billion of 2005
Linv_cyc=investment deviation from Hodrick Prescott trend
Lgdp_cyc=GDP deviation from Hodrick Prescott trend
lgov_cyc=Gov consumption deviation from Hodrick Prescott trend
Derp+Dummy for Economic Reform Program period 1+after 1991; 0 otherwise

Annex 2 - Estimation of Labor Share in National Income for Egypt

The labor share shows how much of national income accrue to labor. The narrow measure of labor share refers to the ratio of total compensation of employees (wages and salaries before taxes, as well as employers' social contributions) over income (GDP). However, this measurement may underestimate the labor share because:

1. National accounts do not include income generated from self-employment (owners of incorporated businesses) under total compensation.
2. Employee compensation excludes some important forms of non-wage compensation; mainly earned by "non-paid family workers".
3. In Egypt, according to CAPMAS[25] data on labor force, these two categories (self-employed and non-paid family workers) represent 27 percent of the total number of workers. Moreover, 70 percent of the private sector workers are working in unincorporated enterprises. Hence, they account for a substantial fraction of the workforce.

Methodology

1- Numbers of self-employed and non-paid family workers are obtained from Labor Force Sample Surveys produced by CAPMAS.
2- Distribution of the two categories of workers over economic activities are obtained from the Egypt Labor Market Panel Survey (ELMPS 2006) produced by Economic Research Forum (ERF), with the cooperation of the Population Council and CAPMAS. The 2006 distribution is applied to 2007 number of workers mentioned above.
3- Income of each category is estimated by multiplying number of workers in each economic activity by the average wage within the same economic activity. In the absence of accurate information on the two categories workers' earnings, we assume that their income is similar to wages of employees in the same economic sector. In other words, we assume that corporate and non corporate workers receive the same average compensation.
4- Average wages are obtained from CAPMAS.
5- Estimated income of self-employed is attributed to both labor and capital shares because they reflect both the returns on labor inputs and on capital investment. We do this by assuming that labor and capital shares are approximately the same for self-employed as they are in the

[25] Central Agency for Public Mobilization and Statistics, the official source for provision of data and statistics in Egypt.

corresponding ratio in the respective economic branch (obtained from national accounts 2006/07).[26]

6- Estimated income of "non-paid family workers" is fully considered as returns on labor input because it is assumed that non paid family workers are providing almost pure labor services.

7- Labor share in self-employed workers income, and estimated income of the non-paid family workers are added to the compensation of employees income (from the formal sector and listed in the national accounts) to obtain the total share of labor in national income.

Estimation of labor share

$$\text{1) Labor share} = \frac{\text{Compensation of employees} + \text{Imputed Labor Compensation of Self-employed} + \text{Estimated income of non-paid family workers}}{\text{GDP} - \text{Net indirect taxes}}$$

Labor share in national income = 32%

2) Another measurement would be to treat *the totality* of self-employed earnings as labor income, thus assuming that this category of workers provide almost pure labor services. This would give a total labor share in income of 36 percent. However, the shortcoming of this approach is that it tends to overstate the labor share of national income because, even in developing countries, the self-employed tend to have substantial amounts of capital in their businesses.

Remarks:

1- Compensation of employees reported in national accounts refers to wages and salaries only and do not include employer social insurance contributions and benefits.

2- Data of the Egypt Labor Market Panel Survey (ELMPS) 2006 underestimates female work for self-employed workers and non-paid family workers in many economic sectors. Therefore, total number of workers in these two categories is believed to be underestimated.

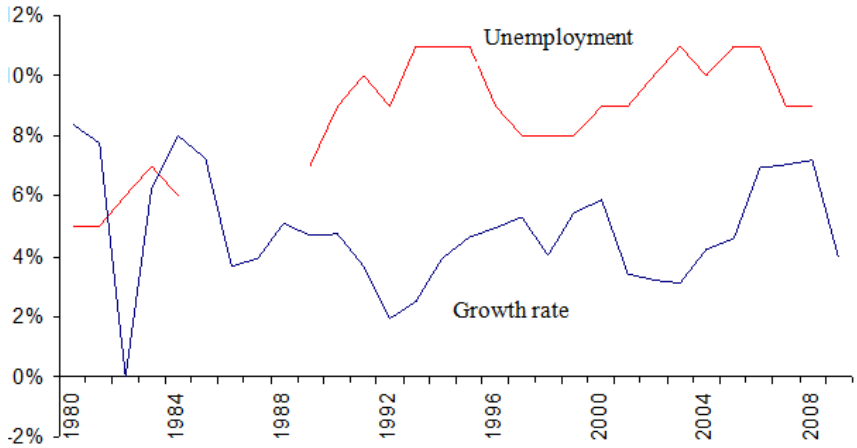
3- Our estimation is consistent with general findings that developing countries are more likely than rich countries to have low shares of employee compensation in GDP.

[26] This is the best approximation we can do although we understand that it implicitly assumes that income shares are the same for establishments that differ significantly in size and structure. Another common convention is to allocate two-thirds of income to labor earnings and one third to capital income, but this remains a rather arbitrary measure to classify income of business owners.

Annex 3 - Estimates of the dynamic relationship between unemployment and growth in Egypt, and estimates of the employment elasticity to output growth

Figure A4.1 shows the evolution of GDP growth and unemployment in Egypt for the period 1980-2008. It shows a rising trend in unemployment during the eighties that coincides with a downward trend in growth. After that period, the series stabilize but with clear negative associations, especially in the early and mid-nineties, as well as in early and mid-2000s.

Figure A3.1 – Unemployment and Growth rates



Source: CAPMAS and MOED
Note: Data between 1985 and 1989 are not available for unemployment.

To estimate the relationship allowing for a dynamic interaction between both variables, regardless of the order of integration of the two series, we estimated an Autoregressive Distributed Lag (ARDL) model. Initially lags of up to 3 years were considered, but different model selection tests (Akaike, Schwartz, R-Bar squared) indicated a (1,0) model was preferred.

Table A 4.1 summarizes the error correction model (short run dynamics), and Table A2 presents the long run estimates.

Table A3.1- Short-Run Dynamics of the relationship between Unemployment and Growth

Error Correction Representation for the Selected ARDL Model
ARDL(1,0) selected based on Schwarz Bayesian Criterion

Dependent variable is dUNEMPLOY
22 observations used for estimation from 4 to 25

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dGROWTH	-0.296	0.128	-2.318 [0.032]
dC	0.05	0.014	3.580 [0.002]
ecm(-1)	-0.383	0.126	-3.052 [0.007]

List of additional temporary variables created:
dUNEMPLOY = UNEMPLOY-UNEMPLOY(-1)
dGROWTH = GROWTH-GROWTH(-1)
ecm = UNEMPLOY + 0.773*GROWTH - 0.132*C

R-Squared	0.396	R-Bar-Squared	0.332
S.E. of Regression	0.009	F-stat. F(2, 19)	6.223 [0.008]
Mean of Dep. Variable	0.001	S.D. of Dependent Variable	0.011
Residual Sum of Squares	0.002	Equation Log-likelihood	73.555
Akaike Info. Criterion	70.555	Schwarz Bayesian Criterion	68.918
DW-statistic	2.198		

Table A3.2 - Estimated Long-Run Coefficients using the ARDL Approach

ARDL(1,0) selected based on Schwarz Bayesian Criterion

Dependent variable is UNEMPLOY
22 observations used for estimation from 4 to 25

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
GROWTH	-0.773	0.379	-2.042 [0.055]
C	0.132	0.020	6.746 [0.000]

By means of the same method (ARDL) we examine the elasticity of employment to output growth in Egypt, using all available data. First we work with yearly information on employment and output for 1982-2009, and then we use quarterly information on employment and GDP.

Table A4.3 and A4.4summarize the long run estimates of the elasticity with and without the deterministic time trend. The value and statistical significance of the elasticity decrease significantly when a deterministic trend is introduced in the model: from .53 it falls to zero. The long run is 6 years, according to the error-correction term estimate (Table A4.5). The short run elasticity (Table A4.5) is 0.29.

Table A3.3 - Estimated Long-Run Coefficients using the ARDL Approach (with Deterministic trend)

ARDL(1,1) selected based on Schwarz Bayesian Criterion

****

Dependent variable is LEMPL

24 observations used for estimation from 1985 to 2008

****

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
LGDP	-0.008	0.404	-0.019 [0.985]
C	4.094	0.795	5.151 [0.000]
T	0.011	0.007	1.476 [0.156]

****

Table A3.4 - Estimated Long-Run Coefficients using the ARDL approach without deterministic trend)

ARDL(1,1) selected based on Akaike Information Criterion

****

Dependent variable is LEMPL

24 observations used for estimation from 1985 to 2008

****

Regressor	Coefficient	Standard Error	T-ratio[Prob
LGDP	0.536	0.136	3.936 [0.001]
C	3.205	0.663	4.832 [0.000]

****

Table A3.5 Error Correction Representation for the Selected ARDL Model

ARDL(2,1) selected based on Akaike Information Criterion

****

Dependent variable is dLEMPL

24 observations used for estimation from 1985 to 2008

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLEMPL1	0.295	0.217	1.356 [0.191]
dLGDP	0.134	0.055	2.452 [0.024]
dC	0.662	0.423	1.565 [0.134]
dT	0.002	0.001	1.417 [0.173]
ecm(-1)	-0.160	0.107	-1.495 [0.151]

****

List of additional temporary variables created:

dLEMPL = LEMPL-LEMPL(-1)

dLEMPL1 = LEMPL(-1)-LEMPL(-2)

dLGDP = LGDP-LGDP(-1)

dT = T-T(-1)

ecm = LEMPL + 0.056*LGDP -4.147*C -0.012*T

****

R-Squared	0.488	R-Bar-Squared	0.346
S.E. of Regression	0.001	F-stat. F(4, 19)	4.290 [0.012]
Mean of Dependent Variable	0.011	S.D. of Dependent Variable	0.002
Residual Sum of Squares	3.33E-05	Equation Log-likelihood	127.819
Akaike Info. Criterion	121.819	Schwarz Bayesian Criterion	118.285
DW-statistic	2.041		

****

R-Squared and R-Bar-Squared measures refer to the dependent variable dLEMPL

Using quarterly data, the long run elasticity is 0.4 (Table A4.6). Based on the error correction term estimate (Table A4.7), the long run is 2 quarters. The short run elasticity is close to zero.

Table A3.6 - Estimated Long-Run Coefficients using the ARDL approach

ARDL(1,1) selected based on Schwarz Bayesian Criterion

****

Dependent variable is LEMPL

20 observations used for estimation from 2004Q2 to 2009Q1

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
LGDP	0.404	0.265	1.5236 [0.148]
C	3.457	0.525	6.5888 [0.000]
T	0.002	0.002	1.1601 [0.264]

****

Table A3.7 Error Correction Representation for the Selected ARDL Model

ARDL(1,1) selected based on Akaike Information Criterion

****

Dependent variable is dLEMPL

20 observations used for estimation from 2004Q2 to 2009Q1

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLGDP	0.04	0.062	0.656 [0.521]
dC	1.81	1.018	1.778 [0.094]
dT	0.001	0.001	0.813 [0.428]
ecm(-1)	-0.524	0.232	-2.253 [0.039]

****

List of additional temporary variables created:

dLEMPL = LEMPL-LEMPL(-1)

dLGDP = LGDP-LGDP(-1)

dT = T-T(-1)

ecm = LEMPL -0.404*LGDP -3.457*C -0.002*T

****

R-Squared	0.501	R-Bar-Squared	0.368
S.E. of Regression	0.005	F-stat. F(3, 16)	5.018 [0.012]
Mean of Dependent Variable	0.004	S.D. of Dependent Variable	0.006
Residual Sum of Squares	3.30E-04	Equation Log-likelihood	81.763
Akaike Info. Criterion	76.763	Schwarz Bayesian Criterion	74.274
DW-statistic	1.913		

****

R-Squared and R-Bar-Squared measures refer to the dependent variable dLEMPL

Annex 4 - On the use of public investment as a counter-cyclical tool in Egypt

A Generalized Vector-Autoregression Approach

Summary and policy implications

This annex presents some evidence of the relationship between investment, in particular public investment, and growth in Egypt during 1960-2008. The analysis is based on econometric estimation of a production function, which expresses output as a function of the capital stock and employment. The model is extended to incorporate restrictions imposed by long run relationships between Egypt and its main trading partners, namely the OECD and the MENA region. The main policy implications of these preliminary findings are:

a. The impact of public capital on GDP is not big, and it is smaller than the impact of overall capital. Hence, policies conducive to private capital formation should, in general, be preferred as growth-promoting tools. To compensate a 1 percentage point growth slowdown originating from the shock to OECD growth, the capital stock has to increase by about 2 percentage points of GDP.

b. From the policy perspective, it is important to differentiate between investment and public capital, as not every dollar of investment effort is translated into a dollar of capital stock. There are leakages or "inefficacy" of investment. Hence, allowing space for inefficacy would imply an even larger amount of investment. However, this would imply that policy is validating the inefficiency, when it should be aimed at reducing it.

c. Private capital decreases as public capital increases. We found a strong substitution effect of public and private capital in the short run. This explains the low "productivity" of public capital in the short run. In the long run, however, there is some evidence of these two factors being complements.

d. These results point at the necessity of rigorous economic analysis of individual projects to ensure the rationale of public sector intervention, and to minimize the leakage from public investment to public capital. Otherwise, the substitution effect and the inefficacy of public investment will lead to undesired effect of increased public investment leaving the economy worse-off.

Some of these results are comparable to those reported elsewhere (World Bank, 2008 and Favero, Giavazzi and Missale, 2009), though different methodologies are employed. Robustness of these results, however, still has to be evaluated, given uncertainty about the quality of the data, and the limited degrees of freedom. Another crucial step is to incorporate the role of the financing (debt or taxes) of the additional public spending. Probably this will require a modeling approach that complements the purely econometric estimation adopted here.

Methodology

Based on a production function approach, we verify the existence of a long run equilibrium relationship between output, capital stock and employment.[27] This simple framework is extended to incorporate information from international factors that are relevant for the Egyptian economy, such as the oil price, and the output growth of OECD economies and the MENA region.

The enlarged system consists of 5 variables: Egypt's GDP *(EGDP),* capital stock level (*KSTO*), OECD GDP (*OECD*), MENA GDP (*MENA*), and the oil price in real terms (*OILPR*).[28] We restrict the system to two equilibrium relationships (cointegrating vectors) between these 5 variables, as these will impose constraints in the short run output fluctuations equation (error-correction equation for Egypt's output), shown in Table 1. To estimate the impulse-responses and the variance decompositions, we used a Generalized Vector Autoregression (GVAR) approach, which has the advantage of bypassing the ordering problem generally found in VAR analysis (Koop, Pesaran and Potter, 1996)

The following results summarize the exercise:

1. The error-correction equation for GDP has a good explanatory power (R-Bar of 56 percent), and all the signs are the expected ones.
2. There seems to be no major structural breaks in the relationship between these variables (based on sum of residuals test and sum of squared residuals test)
3. The variability of output in the short run is explained mostly by inertia of the GDP series, the OECD output, and regional MENA output (based on the forecast error variance decomposition)
4. The impulse response functions show the expected responses to various shocks. The one we wish to highlight is the response of GDP to a shock in the capital stock (Figure 1). The magnitude of a shock is 0.5 percent of the capital stock[29] (or, close to 1 percent of GDP), and the response of the system shows that output increases by approximately 0.5 percent during the 4 years following the shock.

[27] The data is annual from 1960-2008, and is an update of a recently used in the Egypt Development Policy Review (World Bank, 2008). Further work is currently being done to refine these calculations.

[28] Initially we omitted the employment variable given that it turned out statistically insignificant and the extremely limited degrees of freedom. Future revisions of this note will use output and capital stock per worker.

[29] This is one standard error of the series.

Table A4.1 – Short-run output fluctuations in Egypt

Error-correction model (ECM) for Egypt GDP estimated by OLS based on cointegrating VAR(2)

****

Dependent variable is dLEGDP601
41 observations used for estimation from 1968 to 2008

****

Regressor	Coefficient	Standard Error	T-Ratio [Prob]
dLEGDP6011	0.457	0.142	-3.227 [0.003]
dLKSTOTO1	0.490	0.122	4.005 [0.000]
dLOILPRI1	0.027	0.013	2.018 [0.052]
dLMEGDP651	0.293	0.120	2.455 [0.019]
dLOEC60101	0.545	0.223	2.446 [0.020]
ecm1(-1)	-0.050	0.008	-6.162 [0.000]
ecm2(-1)	-0.003	0.008	-0.387 [0.701]

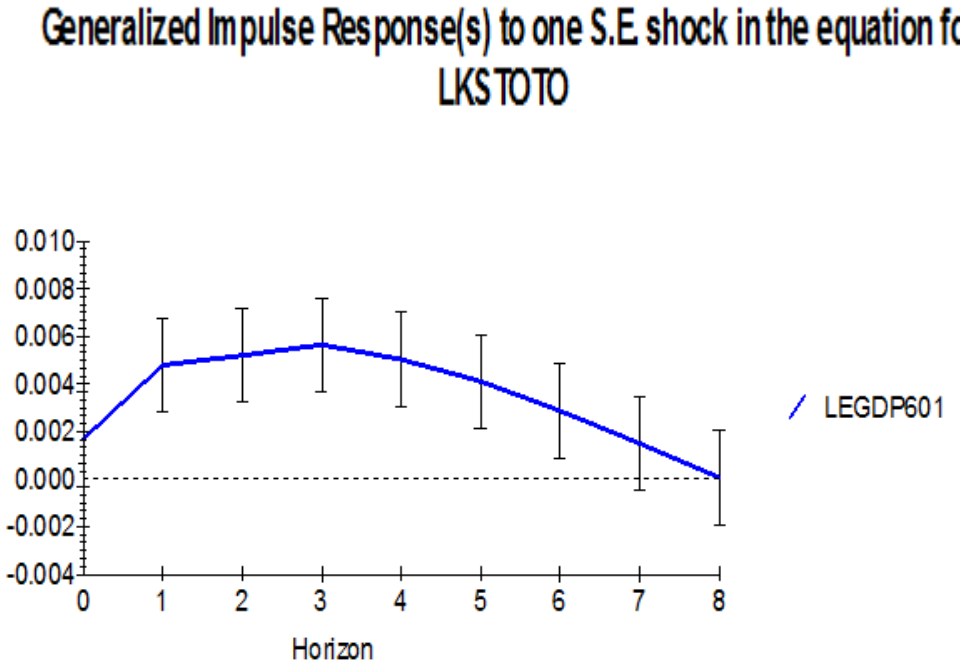
****

List of additional temporary variables created:
dLEGDP601 = LogGDP-Log GDP(-1)
dLEGDP6011 = LogGDP601(-1)-LogGDP(-2)
dLKSTOTO1 = Log KSTOTO(-1)-LKSTOTO(-2)
dLOILPRI1 = Log OILPRI(-1)-Log OILPRI(-2)
dLMEGDP651 = Log MENA GDP(-1)-Log MENA GDP(-2)
dLOEC60101 = Log OECD GDP(-1)-Log OECD GDP(-2)
ecm1 = -2.356*LEGDP601 + 0.857*LKSTOTO - 0.580*LOILPRI + 8.258*LMEGDP65
-7.3349*LOEC6010;
ecm2 = 2.223*LEGDP601 + 1.434*LKSTOTO - 0.090*LOILPRI -1.186*LMEGDP65
-4.504*LOEC6010

****

R-Squared	0.628	R-Bar-Squared	0.563
S.E. of Regression	0.008	F-stat. F(6, 34)	.583 [0.000]
Mean of Dependent Variable	0 .021	S.D. of Dependent Variable	0.012
Residual Sum ofSquares	0.002	Equation Log-likelihood	143.228
Akaike Info. Criterion	136.227	Schwarz Bayesian Criterion	130.230
DW-statistic	1.845	System Log-likelihood	629.690

****



The
elasticity of output with respect to the capital stock as estimated from the previous exercise may still be of limited value for policy purposes for several reasons: a) it does not differentiate between investment and capital; b) it does not differentiate between public and private investment, assuming the same "productivity" for both types of capital. c) it does not contemplate possible responses of private capital to the shock in public capital

a) **Investment is not the same thing as capital.**

There are inefficiencies in converting a dollar of investment into capital, especially in the public sector. There are alternative ways to estimate this "inefficiency": one, is to follow Pritchett (2000) based on a growth decomposition exercise for a sample of countries for over 30 years. He observed that total factor productivity (TFP) growth is extremely low, and even negative, and interpreted this as the result of an overstatement of the reported capital accumulation. Pritchett points out that it is inappropriate to measure capital as the accumulation of depreciated investment efforts that are not necessarily effective. Hence he estimated the growth rate of capital that would be consistent with TFP growth of between 0 and 1 percent per year. This growth rate is much lower than capital growth rate actually reported in the entire sample of countries. The difference between both is the degree of inefficiency in investment.

Pritchett estimates the "inefficiency" across the world. For the MENA region, he estimates the efficacy of investment at 46 percent. According to these estimates, every dollar of investment spending translates into 0.46 to the capital stock.

The other approach to estimate the inefficiency is econometrically as proposed by Hurlin (2006). He estimates for some LAC countries the "efficacy" parameter at around 40 percent, though the efficacy depends on the specific type of infrastructure and the amounts being invested, with efficacy falling as the magnitudes of investment increase.

Both options indicate that assuming an effectiveness level of the order of 60 percent, at most would be realistic. Hence, if there is a shock to OECD growth of about 2 percentage points, the impulse response function of Egyptian growth will be of about 1 percentage point slower growth. To compensate that, the capital stock would have to increase by about 2 percentage points of GDP, which in turn would require additional investment of 3.3 percent of GDP. A relevant policy question is whether this additional space for ineffectiveness should be validated. Clearly the economic analysis of projects, and expenditure monitoring would tend to reduce this leakage of resources.

b) Response of private sector to increased public capital

To differentiate between the impact of public and private capital on output, we separated the capital stock into its public sector and private components. The data comes from the Egypt **Development Policy Review** (DPR).

Table 2 shows the equation for Egyptian output growth. The regression shows improvement in the explanatory power (to 64 percent, compared to the previous 56 percent). The impulse response function (Figure 2) shows that a 1 percent of GDP shock to public capital increases output by about 0.15 percent. This extremely low value is probably due to the decline in private capital in the short run (Figure 3). However, in the lng run there seems to be positive response of private capital to the increase in public capital Certainly the modeling effort has to be refined to include the financing effects of the additional public spending, but the limited degrees of freedom might force an alternative strategy to the strictly econometric one, along the lines described by King (1995).

In Table 2 we can also appreciate a different impact of private and public capital stocks on growth. The short run impact of the private stock is 1.8 times that of the public sector. The statistical significance of both coefficients also differs, with the public sector coefficient being insignificant at the 5 percent confidence level. In the long run there are even more striking differences, that still have to be validated.

The main policy implication of these results is that, to avoid the substitution effect and maximize the impact of public spending on output and social welfare, it is a necessary condition to do rigorous economic appraisal of projects that begin by verifying the rationale for public intervention in specific activities.

Table A4.2 - Short run output equation, differentiating public and private capital

ECM for variable LEGDP601 estimated by OLS based on cointegrating VAR(2)

****

Dependent variable is dLEGDP601

41 observations used for estimation from 1968 to 2008

****

Regressor	Coefficient	Standard Error	T-Ratio[Prob]
dLEGDP6011	-0.474	0.124	-3.810[0.001]
dLKSTOPUB1	0.201	0.108	1.864[0.071]
dLKSTOPRI1	0.363	0.084	4.339[0.000]
dLOILPRI1	0 .032	0.014	2.291[0.029]
dLMEGDP651	0.205	0.098	2.097[0.044]
dLOEC60101	0.301	0.183	1.644[0.110]
ecm1(-1)	-0.0473	0.007	-6.494[0.000]
ecm2(-1)	-0.018	0.007	-2.487[0.018]

****

List of additional temporary variables created:

dLEGDP601 = LEGDP601-LEGDP601(-1)

dLEGDP6011 = LEGDP601(-1)-LEGDP601(-2)

dLKSTOPUB1 = LKSTOPUB(-1)-LKSTOPUB(-2)

dLKSTOPRI1 = LKSTOPRI(-1)-LKSTOPRI(-2)

dLOILPRI1 = LOILPRI(-1)-LOILPRI(-2)

dLMEGDP651 = LMEGDP65(-1)-LMEGDP65(-2)

dLOEC60101 = LOEC6010(-1)-LOEC6010(-2)

ecm1 = 4.2030*LEGDP601+ 2.5034*LKSTOPUB-1.3201*LKSTOPRI +1.3216*LOILPRI -7.0216*LMEGDP65 -0.78338*LOEC6010;

ecm2 = -0.73984*LEGDP601-1.9216*LKSTOPUB+ 1.4130*LKSTOPRI - 0.85086*LOILPRI - 2.3742*LMEGDP65 + 4.6655*LOEC6010

****

R-Squared	0.707	R-Bar-Squared	645
S.E. of Regression	0.007	F-stat. F(7, 33)	11.363[0.000]
Mean of Dependent variable	0.021	S.D. of Dep. Variable	0.012
Residual Sum of Squares	0.002	Equation Log-likelihood	148.083
Akaike Info. Criterion	140.083	Schwarz Bayesian Criterion	133.229
DW-statistic	1.756	System Log-likelihood	760.899

Figure A4.2 - Generalized Impulse Responses to one S.E shock in the equation for LKSTOPUB

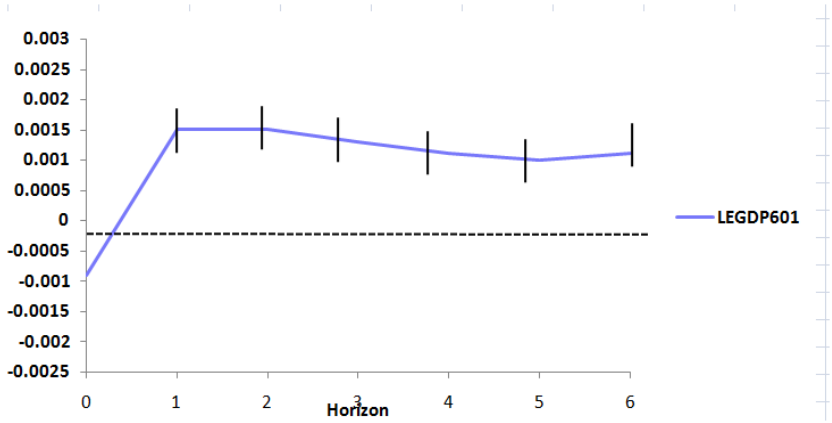
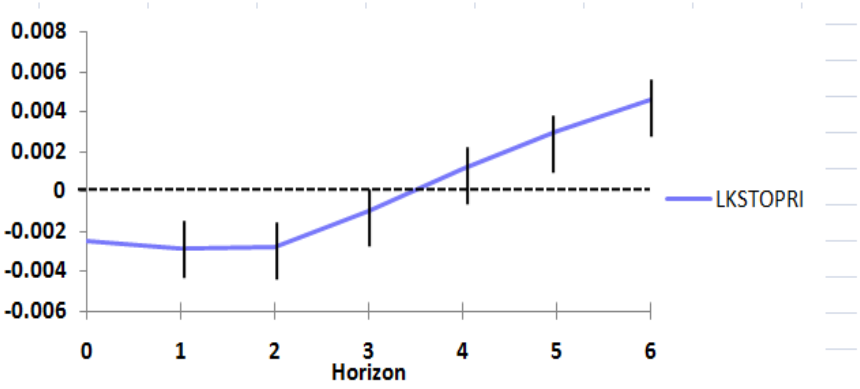


Figure A4.3 - Generalized Impulse Responses to one S.E shock in the equation for LKSTOPUB



The above results are comparable to those of a previous World Bank report, which we reproduce here for the sake of completeness. That report tackled two questions[30]: (1) are private and public capital substitutes (i.e. could one be replaced by the other); and (2) which contributes more to generate the output? To answer them, the DPR estimated a production function where labor combines with "composite capital" that in turn consists of a combination of private and public capital where the degree of substitution between the two is estimated.

More formally,

$$Y = A[\delta K_{PUB}^{\psi} + (1-\delta)K_{PRI}^{\psi}]^{\frac{\alpha}{\psi}} L^{1-\alpha}$$

where Y represents aggregate output, A is the efficiency parameter, K represents capital, the subscripts PUB and PRI denoting public and private respectively, δ indicates the relative importance of public

[30] The material that follows reproduces Annex 1 of that report.

$$\sigma = \frac{1}{1-\psi}$$

capital, α is the share of overall capital in production, and ψ is a parameter directly related to the elasticity of substitution between private and public capital (more precisely, the elasticity).

A constant-elasticity-of-substitution (CES) production function forms the "composite capital" from combining public and private capital; and a Cobb-Douglas production function combines this composite capital with labor to produce the final output.

As is standard in the literature, the regression equation is estimated in growth rates (not levels expressed above) to make the series stationary and avoid spurious correlation

$$\dot{Y} = \dot{A} + \alpha * \frac{[\delta K_{PUB}^{\psi} K_{PUB} + (1-\delta) K_{PRI}^{\psi} K_{PRI}]}{[\delta K_{PUB}^{\psi} + (1-\delta) K_{PRI}^{\psi}]} + (1-\alpha)\dot{L}$$

where a dot above a variable denotes growth rate. This function is estimated applying non-linear least squares with annual data for two periods: 1960-2006 (which has more observations) and 1983-2006 (which includes only the years with better quality data). For technical reasons, $\rho = (1-\psi)^2$ is estimated (not ψ), from which σ is calculated using the restriction that $-\infty < \psi < 1$.

Table 1.1 shows that the estimates for the two periods are of similar orders of magnitude.

Table A4.3 - Estimate of Parameters

Period	α	δ	ρ	σ
1960-2006	0.35	0.21	1.09e-12	986895.1
	(0.091)	(0.486)	(9.10e-06)	
1983-2006	0.29	0.16	1.45e-10	83055.52
	(0.165)	(0.535)	.0001383	

Source: Standard Errors in parentheses.

The α (capital's share of output) estimated for the 1960-2006 period is 0.35, close to 0.4 assumed for the Solow growth decompositions and similar to estimates for other countries. The estimated ρ is small which implies a very high elasticity of substitution between public and private capital, σ, and that ψ is close to unity. The relative contribution of public capital in the formation of composite (or overall) capital in the economy, δ, is estimated to be 0.21: in other words, private capital's contribution to the economy's productive capital stock was four times that of public capital.

Annex 5 - Statistical Appendix

Table A5.1 - Basic Macroeconomic Indicators

	YR91	YR92	YR93	YR94	YR95	YR96	YR97	YR98	YR99	YR00	YR01	YR02	YR03	YR04	YR05	YR06	YR07	YR08
GDP (US$)	35851	41876	46294	51697	60138	67640	78466	84829	90597	97954	90284	84206	80288	78782	89601	107426	130433	162818
GDP Per Capita (Current US$)	607	694	753	825	942	1039	1183	1255	1316	1396	1262	1155	1081	1040	1161	1367	1629	1997
Population growth (%)	2.24	2.08	1.96	1.91	1.91	1.91	1.90	1.90	1.90	1.91	1.92	1.92	1.92	1.91	1.90	1.88	1.86	1.83
GDP growth (%)	3.7	1.9	2.5	3.9	4.7	5.0	5.3	4.1	5.4	5.9	3.4	3.2	3.1	4.2	4.6	6.9	7.1	7.2
GDP growth by Sector (%)																		
Agriculture	2.4	2.0	2.5	3.8	2.9	3.1	3.4	3.6	3.5	3.4	3.7	3.6	2.8	3.4	3.3	3.2	3.7	3.3
Industry	4.8	1.6	2.2	5.5	5.0	18.0	-7.0	4.0	6.6	5.3	3.1	3.6	1.6	2.6	4.0	9.8	8.0	30.5
Services	3.3	2.1	2.7	3.0	5.0	-3.3	16.1	4.2	5.3	7.0	3.5	2.8	4.2	5.5	5.4	6.2	7.4	-6.8
GDP growth by demand component (%)																		
Private consumption (%)	4.14	3.27	2.97	4.23	3.32	4.02	4.21	2.24	4.62	5.15	3.99	2.17	2.33	2.10	4.83	6.44	6.94	5.73
Gross Fixed Capital Formation (%)	-8.59	-3.42	-13.36	10.42	6.42	11.35	13.38	22.64	3.93	-2.30	-2.19	5.51	-8.74	6.17	14.22	13.79	23.76	14.81
Share of GDP (% GDP)																		
Private consumption	84.18	83.03	84.41	84.86	85.00	87.31	88.49	88.00	86.64	87.06	86.59	86.36	85.70	84.42	84.29	82.89	83.73	83.20
Gross fixed capital formation	23.73	19.91	18.69	19.43	19.17	17.31	17.94	21.33	20.81	18.94	17.73	17.81	16.31	16.40	17.92	18.73	20.85	22.28
Gross domestic savings	15.82	16.97	15.59	15.14	15.00	12.69	11.51	12.00	13.36	12.94	13.41	13.64	14.30	15.58	15.71	17.11	16.27	16.80

Table A5.1 - Basic Macroeconomic Indicators (Cont'd)

	YR91	YR92	YR93	YR94	YR95	YR96	YR97	YR98	YR99	YR00	YR01	YR02	YR03	YR04	YR05	YR06	YR07	YR08
External Sector																		
Trade Balance (US$)	-7175	-6174	-7003	-7310	-7854	-9498	-10219	-11771	-12563	-11472	-9363	-7517	-6615	-7834	-10359	-11986	-16291	-23415
Current Account Balance (US$)	3820	2670	2295	410	386	-185	119	-2479	-1724	-1163	-33	614	1943	3418	2911	1752	2269	888
Foreign Direct Investment (US$)	1,125	1,152	1,140	1,321	783	627	770	1,104	711	1,656	509	428	701	407	3,902	6,111	11,053	13,237
International Reserves (L.E)										15130	14244	14147	14809	14781	19302	22931	28559	34572
In months of imports of Goods and NFS										8.0	7.9	8.7	9.1	7.6	7.7	7.2	7.5	6.6
External Debt (US$)			30,136	30,905	32,967	31,047	28,769	27,946	27,846	27,196	25,345	28,661	29,396	29,872	28,949	29,593	29,898	33,893
External Debt to Exports (%)			249.9	257.2	227.2	203.7	173.5	179.3	180.0	152.7	135.0	171.2	157.6	127.5	100.3	82.4	70.4	59.9
Interest Payments to Exports (%)			10.7	10.7	9.2	7.8	6.0	4.6	5.1	4.3	3.9	4.1	3.4	2.5	2.0	1.6	1.4	1.2
Nominal Exchange Rate (eop)(end of Year)	3.4	3.4	3.4	3.4	3.4	3.4	3.4	3.7	4.5	4.5	6.2	6.1	5.7	5.7	5.5	5.5	5.5	5.7
Real effective exchange rate	94.9	100.0	107.0	112.6	119.7	123.5	125.4	127.9	128.6	125.6	111.9	141.3	112.8	88.4	92.1	99.6	91.7	88.8
Public Sector																		
PS. Overall Balance (% of GDP)	7.3	5.5	3.6	2.1	1.2	1.3	0.9	1.0	3.6	3.9	6.0	10.2	10.4	9.5	9.6	8.2	7.3	6.8
Net Public Sector Debt (% of GDP)	731.5	545.2	356.3	211.3	124.4	130.6	87.6	98.1	355.1	394.0	601.7	1015.7	1043.3	945.3	959.0	815.7	734.4	682.5
Economic Activity																		
Unemployment (%)			11.1	11.3	11.8	9.5	8.1	8.0	8.2	9.0	9.2	10.2	11.0	10.3	11.2	10.6	8.9	8.7

Table A5.2 - Domestic and International Financial intermediation

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Money Supply																		
Annual growth (%)	na	12.0	16.3	15.4	11.9	10.8	11.4	11.6	12.1	1.9	7.4	11.9	12.4	15.5	15.6	21.8	20.1	29.9
Policy interest rate*	na	na	na	na	na	na	na	na	na	na	na	na	na	na	9.5	8.0	8.8	10.5
Credit market																		
Total Credit growth (%)	na	1.5	4.9	11.7	11.5	16.9	17.8	15.3	21.3	11.6	12.4	11.9	7.6	8.9	10.6	9.2	4.3	7.5
Total credit (% GDP)	89.3	73.3	68.9	68.3	65.3	67.9	69.0	73.6	83.4	84.2	89.7	95.0	92.8	87.0	86.7	82.5	71.3	63.8
Credit to the private sector growth (%)	na	5.1	21.5	22.9	33.1	27.2	27.5	25.5	24.6	13.4	9.6	11.5	6.6	4.5	3.6	8.6	12.3	12.6
Credit to the private sector (% GDP)	28.3	24.0	26.2	28.5	32.6	36.8	40.5	47.1	54.8	56.2	58.4	61.6	59.6	53.6	50.0	47.4	44.1	41.3
Headline lending interest rate**	na	na	na	na	na	na	13.2	13.2	12.8	13.1	13.6	14.1	13.5	13.3	13.4	12.5	12.6	12.0
Capital markets																		
Price index EGX30 - End of June (Base year Jan 1998=1000)	na	na	na	na	na	na	na	794	835	864	593	472	776	1,441	4,829	4,773	7,803	9,827
Market capitalization (% GDP)											30.8	31.3	36.0	35.6	62.6	61.0	80.8	90.8
Inflation: (% p.a.)																		
CPI	14.7	21.1	11.1	9.1	9.4	14.5	6.2	5.7	3.7	2.8	2.4	2.4	3.2	10.3	11.4	4.2	11.0	11.7
WPI***	16.2	18.5	10.2	4.7	5.4	10.1	4.8	0.6	1.7	1.6	1.3	3.5	11.6	17.3	9.9	4.1	11.8	17.6
Total capital inflows (net) (% GDP)																		
- FDI (net)	3.1	2.5	2.2	2.5	1.2	0.9	0.9	1.1	0.7	1.6	0.5	0.5	0.8	0.3	4.3	5.6	8.1	7.4
- Portfolio (net)	0.0	0.0	0.0	0.0	0.0	0.4	1.9	-0.4	-0.2	0.5	0.3	1.2	-0.5	-0.1	1.5	1.9	-1.1	-1.4

*Overnight CBE deposit rate

** Lending 1 year

***+ Starting September 2007, The WPI has been replaced by the Producer price Index PPI.